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EDITORIAL NOTES.

Development and Amalgamation.

THERE is healthy evidence that the gas industry has set itself seriously to consider the question of the adoption of a looking-ahead policy—a matter which the "JOURNAL" has been advocating for some months past. It has been seen at various meetings of gas organizations; and a good contribution was made at the spring meeting of the North British Association of Gas Managers. The gas industry has always been looking ahead; but not in all quarters in a comprehensive sense. There are many more things to be dealt with than the making of provision to meet the demand for gas at an increased rate for a certain period ahead. It is foolish to sit still, and watch change developing all around, without asking, "Is this going to affect our interests?" and, if it is, "How best can we take steps to ensure that those interests are not only protected, but are invested with the conditions which will assist them to advance?" We want prevision in these matters. It is better not to wait for change actually to come, but to be prepared for it early, for preparation requires time; and, as a rule, the attacks of new conditions are not deferred in order to allow a period of grace for gas undertakings to prepare. But there are gas administrators and some executive officials who continue to sit with their hands before them, and their brains dormant, so far as any thought of the morrow is concerned. With them, sufficient for the day is the work thereof; and the protection and elasticity conferred by the maximum attainable efficiency in works and on the district, or by way of provision for future expansion, are not matters of policy and prudence which in any way disturb them. They are by inertness sowing what they will reap.

One of the items in present policy, with the interests of the future well in mind, is amalgamation of the smaller and less efficient undertakings with larger ones, or entering into arrangements with the larger concerns to supply to smaller ones gas in bulk. The question of absorbing small concerns is discussed in the highly valuable paper which Mr. W. E. Whyte, the Clerk and Treasurer to the Middle Ward District Committee of Lanarkshire, read before the North British Association. The author is well qualified to deal with this particular matter, in view of the fact that he took such prominent part in bringing about the notable consolidation of gas interests in Lanarkshire. The policy he then championed and still advocates is a looking-ahead one. True, it is not new; but the many hundreds of small gas undertakings that are throughout the United Kingdom retailing gas at enormous prices certify to the slow growth of the policy. And yet it is very necessary in the interests of the whole industry that better provision should be made for gas supply at a reasonable price in the outer areas. Those areas are the future outlets for the development of the bigger undertakings; to them larger numbers of people are gravitating for residential purposes from the more populous centres. The change is going on; and yet almost unobserved by many men in the gas industry. While this is the case, a political tendency is the consolidation of administrations and public services, with now added to the train of events the adoption by the Government of the policy of concentrating electricity generation. These matters are dealt with by Mr. Whyte; and no one is more capable of discussing them after his successful Lanarkshire enterprise and experience. The remarkable statistics which he gives as to the output of, and the charges for, gas by 237 undertakings in Scotland show that there are many which offer fertile ground for any competitor which may come along. The gas industry cannot afford to allow in any part of its province a rival roundly to beat gas; and yet in Scotland it would be an easy matter for this to be done, when it is seen that of the 237 undertakings only 77 are at present supplying at between 2s. 6d. and 5s. per 1000 c.ft., while 146 are selling at between 5s. and 10s.; and 14 are charging above 10s. To what does this point? Inefficiency and costly operation through inadequacy of resources. The small undertaking is handicapped at every turn through its limitations, to gain substantial relief from which a high-pressure main from larger centralized works, as has been done in Lanarkshire, is an excellent investment. Just look at the analysis of the 237 undertakings which Mr. Whyte supplies in his paper; and in it the technical man can see the disadvantage under which nearly 200 of those concerns labour in respect of providing a reasonably priced supply. No less than 184 sell anything between 1 million and 50 million c.ft. per annum; 20 between 50 and 100 millions; and 33 between 100 and 1000 millions and more per annum.

Consider those figures; and, in doing so, bear in mind—first, that the costs to the small undertakings have oppressively risen since the war, and, through their relatively limited requirements, more in proportion than those of the larger concerns; secondly, electricity generation is being concentrated for the purpose of realizing economy. It is these small gas concerns, with their overload of charges, which will suffer from any advantage accruing from the new order of things electrical. As Mr. Whyte says, these undeveloped areas must not be irretrievably lost to the gas industry. There is an imperative necessity to see that they are supplied with gas by the best and most economical means. It is imperative not only for the districts themselves, but in the cause of protecting the scope of future expansion for the industry. When amalgamation was proposed for Lanarkshire, there was confidence of a substantial economic success. This has already been achieved; but the peak of gain has still to be realized with the fuller development of the scheme. In 1914, there were twelve gas undertakings in the area; and nine have been acquired and consolidated. Uddingston and Cambuslang are now the central manufacturing stations; the others having been abandoned. From the two works, 35 miles of high-pressure mains have been carried. The capital cost of the undertakings was about £600,000; and of the high-pressure mains, £60,000. Working expenses have been substantially reduced, and so has the price of gas. Since the scheme was inaugurated, the charge in one district has dropped by 1s. 3d. per 1000 c.ft.; and in others, by 10d., 1s. 7½d., 2s. 11d., 2s. 9d., 1s. 3½d., and 2s. Those are figures which invite applause, and by them objectors to the industry developing by the aid of consolidation and economical gas generation and distribution must be silenced. They must also incite investigation and examination in other quarters. Notwithstanding this success, Mr. Whyte has still in view a good margin of possibilities with the fuller development of the scheme.

Of course, in every case there should be careful examina-

tion to ensure that there are justifying economies, though it is not always possible to ascertain their ultimate measure before the event. Many of them are more or less hidden; but it is patent that pooling of production, in the case of small undertakings, must confer advantages upon their areas as well as upon the larger concerns. The latter are usually in better position to purchase and deal with materials; the concentration gives greater elasticity in respect of the adoption of the most modern forms of plant, and operating it to the greatest benefit; better technical supervision of processes can be afforded; and greater uniformity of supply can be assured. Where complete amalgamation may not be possible, mutually advantageous working arrangements—such as supply in bulk—may be a feasible proposition; and this is in accordance with the spirit of the South Metropolitan Gas Act of last year. Where this is done, there we get the advantage of local associations being retained with the governing authorities and with the people generally in the area of supply. In some cases, the personal element and personal knowledge are important; in others, past unsatisfactory experiences may be a disadvantage in the new circumstances, and a clean sweep is advisable. The discussion of the paper went whole-heartedly in support of Mr. Whyte's case. To it Mr. J. W. Napier made an important contribution, in which he alluded to the necessity for something being done legislatively to eliminate the parochialism of some of the smaller municipal authorities, which stands in the way of the progress of our public services. There should be no difficulty in this. It has been done in connection with water supply; the Government intend doing it in electricity supply.

There is agreement with Mr. Whyte that it is incumbent upon us to apply our minds to the advisability of developing the gas industry with a bigger and wider conception of its possibilities than has been the case. The industry has to show the country that, by organization within itself, it can perfect gas supply so that it shall be unassailable by electricity. We have to adopt a positive policy. "We in the gas industry can evolve super gas-"manufacturing stations; we can organize our service "on the most up-to-date commercial lines; we can carry "gas to the rural districts; and we can supply it cheaper "than is being done to-day. And in the execution of "this scheme of development, we can assist industry in "no small measure, and brighten the lives and homes of "many thousands of our fellow men." If we can do these things, then let the steps be taken for their accomplishment. It is the duty of the industry.

Sales Development Policy.

The paper which Mr. David Fulton, of Helensburgh, read at the North British Association meeting on "Policy in Developing Gas Sales," taken with the discussion, shows conclusively that no general principles in this regard can be laid down for application throughout the industry. Local circumstances must, to a large extent, guide policy; and in this the factors of past gas policy and current competitive electrical policy must also come under consideration in deciding the effects of any modifying change. In these days progressive gas managers are, as Mr. Fulton says, considering ways and means of increasing the output of gas by offering gas-consuming appliances on such terms as will encourage their adoption by a larger number of consumers, and also the methods by which they can ensure the efficiency in use which is productive of satisfaction, which, in turn, is a good developer of gas consumption through greater use by existing consumers and by attracting new ones. The author also states that the responsible officials of gas undertakings are anxious that, whatever policy is adopted in offering gas-consuming appliances on terms which will secure their adoption, it should be on a financially sound basis. The words "on a financially sound basis" cannot be dismissed by any superficial consideration. There are effects which proceed from policy that do not show a direct financial advantage, but may contain indirect gains of monetary value which are not negligible, and therefore must not be overlooked. We will refer to this point later, after calling attention to the valuable results which have proceeded from the policy applied at Helensburgh, in the circumstances of that town, in connection with cookers, fires, and other gas-heated or heating appliances.

All gas managers are of opinion that a liberal policy should be adopted in the placing of gas-consuming appliances; and, as the author points out, divergence of opinion as to policy is simply limited to the methods to be adopted. Mr. Fulton's paper was published in the "Journal" last week; and, from his data, it will be seen that the policy in increasing the use of gas appliances in that town has been productive of excellent results to the undertaking, and therefore to the consumers. But that policy is *plus* the extremely favourable terms on which gas is supplied. The statistics show the differences in the gas-trading position in the past eight years. In 1919, the number of consumers was 2879; this year it is 3144. This is an increase of only 265 consumers in the eight years, which is small when compared with the magnificent advance there has been in the consumption of gas during the same period. The figures demonstrate that the business has, in the main, been increased through the existing consumers, and therefore through existing service-pipes and meters, which is a great advantage from the capital point of view. In 1919, the consumption of gas was 75,330,800 c.ft.; the estimated consumption this year is 143,000,000 c.ft.—an increase of close upon 90 p.ct. in eight years. The average consumption in 1919 was 26,165 c.ft.; while the estimate this year is 45,483 c.ft. The figures show (despite the addition of 265 new consumers in the interval) an average increase of 19,318 c.ft., or 73·8 p.ct. in the eight years. This is remarkably good; but we could have wished that Mr. Fulton had included in his paper the calorific power of the gas in 1919 as compared with that of 1926, as we see that the gas now supplied is of a thermal value of 450 B.Th.U. per c.ft. If a higher value was supplied in 1919, it would—though perhaps not to any very great extent—affect the interpretation of the difference in average consumption per consumer as between 1919 and this year. However, there is every ground for congratulating Mr. Fulton on the showing he makes by his statistics, and particularly so on the current prices of 2s. 1d. per 1000 c.ft. to ordinary consumers, 2s. 4d. to prepayment consumers, and 1s. 10½d. to industrial users. The ordinary price works out to the low figure of 5·56d. per therm.

In Helensburgh gas appliances are supplied on direct purchase, simple hire, and hire-purchase terms. In the case of cookers costing up to £6 net, the cash price to consumers is net, and fixing is free. In the case of hire purchase, the net cost is charged, *plus* 33⅓ p.ct., which is divided by 30, and three payments have to be made per annum for ten years. The hire-purchase cookers are also fixed free. In the case of cookers costing over £8, the cash price is the net cost, *plus* 10 p.ct., fixed free. For the hire-purchase of these cookers, the net cost is *plus* 25 p.ct., and the sum is divided by 15, or three payments per annum for five years; the fixing is done free. We are not clear as to why there are these differences in the hire-purchase terms. Because a person has a fancy for a higher class cooker than (say) a £6 one, we cannot see the reason for penalizing him by asking him to pay the total cost in five years instead of ten, as in the case of a man who is content with a cooker at £6, or below. And again, if the purchaser of the higher class cooker wishes to pay cash down, why is he charged 10 p.ct., when there is no percentage added to the net cost of the cookers at £6 or below? The terms in vogue for fires, radiators, water-heaters, wash-boilers, gas-irons, &c., are also given in the paper, to which we refer readers for the particulars, which, it will be seen, run very much on the same lines, including free fixing and little profit for cash terms and easy payment under the hire-purchase system. Mr. Fulton admits that this is a conservative policy, and that the terms and conditions would not suit some areas; but it is evident that they do serve their purpose in Helensburgh. It is equally true that a large part of Mr. Fulton's success must be attributed to the low selling price of gas, due to the conservation of capital expenditure over many years, and to certain other favourable local circumstances. The capital charges, for instance, in 1919 amounted to 9·29d. per 1000 c.ft.; in 1925, they

were 6·03d., which is a highly advantageous position for any gas undertaking.

Having regard to the success of the policy in vogue in Helensburgh (including the low price of gas), it is not surprising to find that the author is opposed to what is called a "free cooker" policy, which in the discussion was very much to the fore. Again, it may be said that the application of the "free-cooker" policy must depend very much on local circumstances. There are many arguments *pro et con* which could be adduced; but there are considerations which it is worth while to bear in mind in this connection, in view of modern developments. In the first place, one must not forget that in all existing houses kitchen ranges and fire grates are supplied free for coal burning. While this is so, there must be in many areas—particularly where coal is cheaper than it is in London—a somewhat prevalent disposition to cling to the apparatus which exists rather than adopt gas-consuming appliances if these are going to cost the consumers money. The consideration of being able to obtain such labour-saving appliances, without direct payment, must have an influence in such cases, which would in the end redound to the advantage of the gas undertaking and to the consumers generally. This is one of the indirect beneficial effects which those who advocate so-called "free" cookers can claim. Of course, the cookers are not actually supplied free, as the charges must be included in the price of gas. This point is worth discussing. The question is whether in the end the development of gas sales through the cooker load does not benefit the undertaking and the whole of the consumers. We see that Mr. H. H. Gracie and Mr. James Dickson, and other speakers, were very favourable to the supply of "free" cookers, and were able to give good reasons for their attitude. In Mr. Dickson's remarks, for example, there are some passages referring to his experiences in Dundee which are well worth quoting. He said:

> In Dundee, the policy of supplying free cookers was started in 1904; and it was interesting to note that a year later the quantity of gas delivered was 683,618,200 c.ft., and the capital per million was £570. At that time the price of gas was 2s. 10d.; and the amount absorbed per 1000 c.ft. for annuities, interest, sinking fund, and contingent fund was 8·66d. In 1910 (by which time gas-fires were also given free in the city), the quantity of gas delivered was 879,602,000 c.ft., the capital per million c.ft. delivered was £437, and the price of gas had dropped from 2s. 10d. to 2s. 3d. Not only so, but the charge per 1000 c.ft. for annuities, interest, sinking fund, and contingent fund had dropped to 7·16d. In the interval, the number of appliances had gone up—in the case of stoves from 2264 to 19,961, and in fires from 2558 in 1910 to 16,131 at the present time. The city of Dundee was a good argument for supplying cookers and other appliances free; and at the present moment he was working from that standpoint.

On the other hand, Mr. James Richmond advanced in opposition the maxim that "Every herring should hang by its own tail." Now let us examine that maxim by the experiences in the electricity industry in relation to the extremely low charge that is made for power supply. It is a notorious fact—and it is no use the gas industry attempting to overlook it—that in many areas, where a large power business is done by an electricity undertaking at low prices, the general consumers are better off in respect of the price of current than they would be otherwise. We must take a broad view of this misnamed "free cooker" policy. If the supply of cookers without direct charge is going to extend the consumption of gas, then the profit on the additional gas sold should be of advantage to the undertaking, and to the consumers generally, although per 1000 c.ft. the profit may not be quite so high as on lighting gas. Some people who talk of being unfair to the lighting consumers may be unfair to them by a short-sighted policy. There is the competitive point of view which must also be taken into account. Electricity undertakings are to-day supplying energy for cooking and heating at power rates, as they recognize the advantage of securing an all-the-year-round day load of this character. What are we doing in the gas industry to counter this low price for cooking? In our industry it is a rare thing to find a differential price as between cooking and lighting; and we agree with Mr. David Vass that the supply of cookers without a direct charge is doing something in the nature of a differential price for the purpose of cultivating and preserving this load. There is wisdom in the point. In the case of electricity the hire charges for cookers are of a fairly steep character; but, on the other hand, the charge for the units used, being either at power rates or at the secondary low rate obtaining with a two-part tariff, serves as an inducement for the acceptance of the electric cooker—that is, confining consideration to the question of obtaining the installation of a cooker and the unit cost of current, without going into other auxiliary matters, such as service realized and reliability in operation. At the same time, let it not be thought that we are enamoured of the supply of cookers without a direct charge. Our point is that questions of policy of this kind cannot be standardized, but must be determined according to local circumstances, and particularly local competitive conditions.

Therm Declarations Lag.

The valuable compilation issued to their members annually by the National Gas Council, giving a complete list of the Orders granted under section 1 of the Gas Regulation Act, has come to hand. It deals with the position of affairs at Dec. 31 last. On examining the statistics to ascertain totals and make an analysis of the present position of declarations, the first thing which strikes us is the lamentable lag there is in making further applications under the section. The position of affairs, indeed, is very little better than it was at Dec. 31, 1924. The aggregate number of Orders issued (without taking account of previous declarations which have since been altered) is 578, of which 39 relate to Scotch undertakings, and 13 to Irish. The 578 Orders have been issued to 406 companies, and 147 local authorities or gas boards; making together 553—the difference being due to separate Orders having been made in respect of such blocks of stations as those of the British Gas Light Company, the Holywood and North Wales Gas and Water Corporation, the Stoke-on-Trent Corporation, and the Lanark County undertakings. Referring to the last-issued Board of Trade Returns, there were 467 statutory company concerns and 315 statutory local authority undertakings—together 782. Thus we see, Orders having been issued to only 553 undertakings, there are still 229 to come in. Of this number no less than 168 are local authority and 61 company supplies. Some of the latter are of particularly small size, and can therefore be neglected so far as change is concerned from the volumetric to the therm basis.

From the data compiled by the National Gas Council, we have made the following analysis of the position of the calorific declarations in operation on Dec. 31 last:

Declarations of Calorific Value in Operation at Dec. 31, 1925.

C.V.		C.V.		C.V.	
280	1	450	132	520	4
320	1	460	27	525	4
360	1	465	1	530	2
400	19	470	26	540	4
410	2	475	64	550	5
420	5	480	41	560	2
425	34	490	2	600	1
430	6	500	183	Not dec'd.	1
440	7	510	3		

It will be observed that the figures range from a declaration of 280 B.Th.U. up to 600 B.Th.U. The 280 B.Th.U. is the declaration of Nuneaton, and, as already announced in the "Journal," the Company have given notice of a reduction to 200 B.Th.U. The other exceptionally low ones refer to the small undertaking at Goring, with 320 B.Th.U., and Bungay, with 360 B.Th.U. Lampeter is the concern which has the glory of being the supplier of 600 B.Th.U. gas. Examining the data, it will be observed that declarations of 500 B.Th.U. take the lead with 183, and 450 B.Th.U. declarations come next with 132. It is also found that, of the 578 declarations, 476 come within the zone of 450 and 500 B.Th.U. inclusive—leaving only 102 below 450 or above 500 B.Th.U.; and of these the zone from 400 to 440 claims the greater number.

From the original declarations there have been altogether 76 changes; 64 being in the upward direction, and 12 downwards. Analyzing the changes, we find that in

two cases there has been an ascent to 425 B.Th.U.; five, to 450 B.Th.U.; two, to 460 B.Th.U.; two, to 470 B.Th.U.; sixteen, to 475 B.Th.U.; four, to 480 B.Th.U.; twenty-six, to 500 B.Th.U.; one, to 520 B.Th.U.; three, to 525 B.Th.U.; two, to 540 B.Th.U.; and one, to 560 B.Th.U. The twelve which have descended from higher to lower declarations are: One, to 400 B.Th.U.; two, to 425 B.Th.U.; one, to 450 B.Th.U.; one, to 470 B.Th.U.; three, to 475 B.Th.U.; one, to 480 B.Th.U.; two, to 500 B.Th.U.; and one, to 520 B.Th.U. It will be remarked that the greater tendency has been to get to figures between 450 and 500 B.Th.U.

The Electrical Upheaval.

It is difficult to realize why the electricity industry did not earlier press to be heard by the Government, through a competent tribunal, regarding its views as to the lines which legislation should pursue to assist in developing electricity supply. We admit that the directions the Government scheme would take were not definitely known—everything had been kept secret; and part of this secrecy, it now seems clear, was due to a desire to have time for preparation before having to encounter opposition from the industry. Even the Weir Report was hidden from the industry until the Bill was launched. What was the motive for this? The only explanation we can suggest is that it was to prevent the attack which it was known would have been made upon the scheme at that stage before the Government had adopted the Bill. The Weir Report mirrors only too plainly what is in store for the industry from the capital point of view; the Bill attempts to obfuscate that by direct reference only to the expenditure of the Central Board, but does not screen the autocratic control which has been devised for the industry's future. The whole thing has been cleverly planned from the side of the promoters. However, that does not alter the fact—it only emphasizes it—that it would have been better for the industry to have had a voice in the matter before than after the advent of the Bill. Now that the scheme is before Parliament, the industry (which has not yet been heard at all) is coolly told that there has been enough inquiry; and the Government do not wish to hear any more, even though what they propose is regarded by the industry as being bad nationally and industrially. It is one of the queerest pieces of legislative procedure within our knowledge. We do not recall any instance in which the party having the predominating interest in a question before Parliament has not been granted an opportunity of being heard; but now in this case there is no chance of it other than through the more or less indifferent channel of political representation. We are afraid the singular silence of the electricity industry (prior to knowing what was in store for it) was partly due to its belief that there would be for it a substantial subsidy from national funds; and there was a gleeful rubbing of hands—particularly by the manufacturers of plant, who burst forth into pæans of gratification after the Birmingham speech, but are to-day strangely quiet in the face of the torrent of dissatisfaction from the men of the supply industry. But it ought to have been realized by the latter that no Government would heavily subsidize an industry such as electricity supply without doing something to put strong controlling chains upon it. Now it is found there is to be no subsidy; nevertheless, the Bill presents a scheme of autocratic regulation by a Board, and control by the Electricity Commissioners. The Board are to direct generation; and they will have to possess a big staff to carry on the commercial part of the work of purchasing from the selected stations, and selling in bulk to the distributing undertakings. Not only that, the industry is to be shackled by a new capital and the attendant costs of control and administration in a manner which shows that speculation has run positively mad at headquarters. We can well conceive that the industry would not have been at all averse to the gas industry joining with it in bringing an end to a Bill which, as it stands, can only mean a set-back to the former—not only through the proposed cast-iron regulations, but through the technical scheme itself. To get down a precipice by taking a leap from the top is suicidal; to descend gradually by normal methods means safety. The scheme in the Bill is to force the pace, and to press into a comparatively brief period what it would be better should be developed gradually and normally. A great mistake may have been made in the past; but reformation should not be so drastic as to make it injurious in other respects.

Last week we explained the attitude of the gas industry. It could not well take part in opposing the Bill on second reading; its motives for action where electricity is concerned are always attributed to prejudice. Few people appear able to appreciate that principles may sometimes come into consideration in issues where gas and electricity are concerned. The gas industry feels that this Bill, as it stands, will not be of financial benefit to the electricity industry; if it is not, it may also be financially detrimental to the gas industry as large tax and rate payers. On the other hand, something which is not commercially beneficial to the electricity industry may be so to the gas industry. The latter, however, believes the measure has been altogether ill-conceived, and that it will be of no good from the national point of view. While there are points about the Bill to which the gas industry as trading rivals object, it can be frankly said that, if passed, it will create a precedent which neither the gas nor any other public utility industry desire to have in existence. The electricity industry is kind to the Electricity Commissioners. It acknowledges the good work they have done; but to what has their creation brought the electricity industry or now threatens to bring it? The Bill has only to be read in conjunction with the Weir Report to obtain the answer, which can be summed up in oppressive officialdom and control, and speculation on a gigantic scale. How anyone can be so simple or muddle-headed as to think otherwise, passes comprehension. The Bill strikes not only at the roots of the operations of the industry itself, but at the roots of administration and the technical personnel. The supply undertakings reduced to the position of local distributors and suppliers of current, Boards and Committees will only require a few business men to attend to local commercial management; consulting engineers who have made their names in the electrical world will no longer be necessary; engineering training will only be required by the few officials needed by the selected stations, who will be divorced from district work; and the cleavage will only demand men for the latter with a knowledge of distribution, who can fill up their time in taking charge of sales development. The industry will be the poorer for the change. No industry has ever had a bigger upheaval designed for it. Not only have the provisions of the Bill to be studied, but a comprehensive exploration of the effects have to be made, before there is full appreciation of what it all means.

It was intended when writing last week on one aspect of the second reading debate to refer this week to various points in it; but on again scanning the report of the debate, there is really nothing new in it which is worthy of notice. It has all been heard so many times before. The existence of the Bill simply means that politically the opinion has been formed, through the careful steering of the Electricity Commissioners, that the electricity industry has not known how to take care of itself, or how to develop. Yet the sponsors for the measure are unable to show that in our big industrial areas electricity is not being supplied at as cheap a rate as in any other country. The drift of the speeches was towards the generating economies which could be effected by concentration at selected stations, with a careful ignoring of the contra increased costs of transmission, interconnection, transformation, and so forth. The fact that not more than (say) 30 p.ct. of the costs of electricity supply is attributable to generation, while approximately 70 p.ct. falls outside generation, is a matter that does not find political recognition and expression at inconvenient times. The Minister of Transport did not show how our main industries are to be benefited to larger degree than at present; but he did refer to an expectation that the carrying of electricity to the rural areas would develop industries in them. What assurance has he of that? Industries require not only power, but materials; and materials availability, without long transport costs, is in the industrial districts. But

according to Col. Wilfrid Ashley, artificial sun will be at the disposal of the hens at the farmhouses; and their egg productivity will be increased. But the productivity of chickens cannot be artificially increased without shortening the period of productivity. And cows are to be milked electrically, and without being "shocked." These things our legislators heard—and some of them marvelled at what could be done in our sparsely populated areas by the expenditure of millions. At what cost, to produce a profit, will the electrical energy have to be supplied in those areas? Col. Ashley does not know, nor does any other member of the Cabinet. And yet we are to have this scheme forced upon the country and upon the electricity industry, without the latter having been allowed a single word for or against. All that can be done now is by amendment; unless at a subsequent stage the Bill can be defeated.

In the midst of much other talk during the debate on the second reading, a great deal is found as to that arrantly inconclusive figure, the average consumption of electricity per head of the population, in respect of which this country does not stand so well as the United States and certain European countries which have water power but no coal. The comparison is the one upon which the responsible legislators assert that this country is much in arrear of other countries in the application of electrical power. In the first place, we do not know the population statistics taken in other countries. Nowhere have we seen those figures cited with total outputs, so that investigation could be made as to their authenticity. It would be well to ensure that all corresponding factors are taken into account. Seeing that power has the paramount position in the constitution of the figures, it would be better to take the number of workers employed in power-using industries, and so ascertain how the consumption of electricity stands in that relation. Again, it is unfair to set this country's use of electricity against those which have water power and no coal. That fact makes a substantial difference. If the consumption per head in our industrial areas is taken, it is found that the complexion of the figures is considerably altered. The suppliers of current in such areas assert that they will get into correspondence on the *per capita* basis in their areas with the best attributed consumption per head of the population in other countries. The "Electrical Review" has called attention to certain very pertinent points in this connection. The Weir Committee in their report state that the energy sold per head of the population "by authorized undertakings" is 110 KW.H.; the Electricity Commissioners' Report for 1924 puts the figure at 117, on the basis of the Census Returns for 1921. Our contemporary points out that this figure does not include the energy used for traction and generated at the power stations of railway and tramway authorities, nor does it include "the further large supplies generated privately at stations belonging to industrial and commercial organizations"—including collieries—of which no statistical returns are available. The Weir Report states that "it is estimated that, if energy from every source, both public and private, were included, the consumption per head in this country would be raised from 110 units to about 200." Our contemporary says: "It "should, we think, be realized that this is a very im- "portant question—nearly half the electrical energy that "is believed to be consumed in this country to-day is the "subject of guesswork, at a time when the quantity is of "fundamental importance to the deliberations of Parlia- "ment."

Still more unreliable are the computations of the savings to the country by the adoption of the Government scheme. Never was there a scheme of any kind put before the country by a responsible Government with such hollow foundations as this one, or one so thoroughly backed by platitudinal nonsense; never have a Government proposed and forced such a reorganization of an industry—for the worse, according to the best electrical brains—without extending to the industry the courtesy of a hearing. One thing the Government are anticipating, and it is a stiff and long fight in Committee for modification of the constituent parts of the Bill. Pages of proposed amendments have already been printed in the official parliamentary papers.

Coal Position.

The Executive of the Miners' Federation last week reaffirmed their opposition to any wage reduction, to district agreements as opposed to national ones, and to an extension of hours. Following this, a conference of delegates confirmed the attitude of the Executive on the three points; and this gave a lead to the districts to reject the proposals of the coal owners for a new agreement. The districts are certain to accept the advice of their leaders. However, there has not been by the Federation any rejection of the Commissioners' report so far as all other matters are concerned. The Industrial Committee of the Trades Union Congress have also restated their decision to support the miners so far as the maintenance of wage and hours conditions is concerned; but they have informed the Miners' Federation that negotiations with the owners should be continued in order to obtain a proper understanding of the Commissioners' report, and to reduce the points of difference to a minimum. There was a further conference between the owners and the miners yesterday; and the Premier is keeping in touch with the movements, and in close conference with his colleagues. It is probable there will be an almost immediate further interview between the parties and Mr. Baldwin. That is the position in a nutshell. In little more than a fortnight, the subsidy comes to an end; and agreement appears to be as far off as ever. The position is regarded in Government circles as grave. The extremists are busy in the coal fields—not in educating the miners as to the value of adopting the report, for the purpose of improving the economic conditions of the industry to the future advantage of the miners, but in inflaming their minds on the subject of present wages and hours. That is a short-sighted policy. There is, of course, the possibility that the Federation may allow themselves to be muddled into a strike; but there are level-headed men of the labour world outside the Federation who are working hard to prevent this, if at all possible. They realize that a stoppage of the coal industry would make the present bad conditions much worse; and thus the miners' prospects would not be improved, but would even recede from the state of to-day. Moreover, a stoppage would affect all forms of employment; and the trade unions of the country are not desirous of seeing such a disaster, with industrial conditions as they are. But there is nothing definite upon which one can base prediction. That is the trouble for those who have to provide safeguarding stocks of coal. Mr. A. J. Cook states that representatives of the Federation are meeting the International Committee at Brussels on Thursday or Friday, on which occasion it is hoped to make all the necessary arrangements for preventing coal being sent to this country in case of a strike developing. Mr. Cook uses the expression "lock-out."

A Promotion Revival.

Twelve months have elapsed since the last prospectus of the South Midlands and Berkshire Electric Light and Power Company, Ltd., was circulated. This pretentious title covers the little Eynsham Gas Company, Ltd., to which some day the promoters intend (or say they do) to attach a supply of electricity. The date of the previous prospectus was March 2, 1925; the date of the present one is March 12, 1926. When the prospectus was formerly issued, we received copies of it from gas shareholders, including ladies, living in different parts of the country. Of the new issue, one gas shareholder has already received four copies. Twelve months ago it was stated that it was proposed to instal electricity works in conjunction with the Eynsham Gas-Works, and provide a joint supply of electricity for lighting and gas for heating and cooking. It is still "proposed" to do the same thing. The promoters also point to the fact that gas-works are extremely fine places on which to generate electricity, owing to the ability to utilize coke and waste heat from the carbonization of coal, so reducing fuel transport costs. Besides, there are all the bye-products which these artful promoters dangle before the eyes of their hoped-for speculating public. They point out that the products are: "Tar for roads and dyes, ammonia for fertilizers, carbolic acid for disinfectants, and fuel oil for various purposes, which bye-products are now destroyed where coal is directly burnt in the

furnaces of electricity power stations." We do not anticipate that the world will feel it is a great deal richer, owing to the production of the bye-products from the carbonization of coal by the Eynsham Gas-Works, with its puny gas output of 2 million c.ft. or so per annum. It is noticed that it is proposed to spend £1000 on main extensions, and that the cost of electrification is estimated at £6500. When the former prospectus was issued, it was stated that the proposed expenditure on gas-works extensions was estimated at £2500; and the cost of electrification was calculated at £7000. Apparently prices have gone down somewhat for the latter purpose. In the former prospectus, 9500 8½ p.ct. preference (cumulative and participating) shares of £1 each were offered for sale, together with £1000 7 p.ct. first mortgage debentures at £98. Now we see that the issue of preference shares is 6550, and that of first mortgage debentures £4230. It is also noticed that a couple of the new Directors who take part in some of these promotions have supplanted two of the old ones. The Baronet Soame is still the Chairman, and Major Brigden the Vice-Chairman. Reginald H. Smith and Alex. Martin are no longer members of the Board; but Captain E. F. Hill (Surveyor) and Mr. L. J. Waring (Accountant) have taken their places on the directorate. The name of Thompson, the Solicitor, still appears, as well as that of Turner, the Auditor. In this case the Registered Offices of the Company are at County Chambers, 66½, Corporation Street, Birmingham. Among the agreements we see one which has been effected with the Electricity Gas, Share, Debenture, Investment and Guarantee Trust, Ltd., of 43, Cannon Street. Enough said!

Smoke Abatement Bill.

The Smoke Abatement Bill [*ante*, p. 22] will, there are indications, be heavily attacked with the view of making it a more effective measure than it would be by leaving it as it now stands. Dr. Veitch Clark, the Medical Officer of Health for Manchester, in a report, urges that the Bill should include provisions that dense smoke of any colour shall *per se* constitute a nuisance, of which no defence provided in other sections of the Bill shall be permissible, and that apart from the penalty imposed on the first hearing of the case there shall be a daily penalty of £10. Since reheating, annealing, hardening, and forging of iron have for many years been carried on in Manchester without the production of dense smoke, Dr. Clark recommends that none of these processes shall be included in any modification of the regulations. He also suggests that local authorities be given power to require the provision of equipment to minimize the production of smoke before approving plans for new buildings. A further proposal is "that the Government be requested to take into consideration the possibility of dealing with the smoke nuisance on the same lines as has been adopted in dealing with sewage—that is, by the provision of Smoke Boards, with similar powers and duties to those imposed upon Rivers Boards."

Road Fund Grants.

Many municipal councils are dissatisfied with the grants allowed by the Ministry of Transport for road improvement and maintenance, and are supporting a resolution emanating from the Portsmouth Borough Council. This calls attention to the heavy increasing annual expenditure on the improvement and maintenance of roads which the ratepayers are expected to bear, consequent on the ever-increasing volume of motor and other mechanical forms of transport, which render necessary the use of new and expensive processes for the making and surfacing of roads. The matter has received prominence by a reference to it in the Manchester City Council, the Paving Committee of which are supporting the resolution referred to, and are asking for a generous increase in the Exchequer's contribution to road maintenance. Manchester last year sent up £225,000 in the shape of motor licence fees and taxes, and received back only £25,666 for road maintenance. There is a good margin of ground in those figures for dissatisfaction. The Paving Committee's views are that the number of classified roads should be considerably increased; and that no road, whatever its classification, should receive a grant less than 50 p.ct. of the cost of its upkeep. The present grants of 50 p.ct. of approved expenditure on first-class roads and 25 p.ct. on second-class roads are considered inadequate. The Prime Minister, the Chancellor of the Exchequer, the Minister of Transport, and the local members of Parliament will receive from Manchester the views of its Council.

PERSONAL.

Our American contemporary the "Gas Age-Record" expresses its pleasure at being able to record the fact that His Majesty the King has made Mr. F. W. Goodenough a Commander of the British Empire, in recognition of the work done by him in making the Gas Exhibit the success it was during the two years of the British Empire Exhibition at Wembley. "However," adds the writer, referring to Mr. Goodenough's great work in connection with the B.C.G.A., "the gas industry of Great Britain owes far more to Mr. Goodenough than did the King." The far-reaching results of the activities of the Association are pointed out, and the editorial note concludes: "The 'B.C.G.A.' is a monument to Mr. Goodenough. He is its guiding spirit. To him belongs the honour."

Out of 63 applicants, Mr. J. R. Bradshaw, B.Sc., Engineer and Manager of the Retford Corporation Gas-Works and Water-Works, was on Friday last appointed Engineer and Manager of the Plymouth Corporation Gas-Works at Devonport, at a salary of £750 per annum, rising to £850 by increments of £50 a year. Mr. Bradshaw was Assistant to the Accrington Gas and Water Board from 1904 to 1909, and later became Chief Assistant at the Doncaster Corporation Gas-Works. After a period with the Barrow-in-Furness Corporation, he was appointed in 1913 Engineer and Manager at Retford. He will take up his new post at the end of next month.

The Gas Committee of the Chesterfield Corporation have accepted with regret the resignation of Mr. H. H. Everest, the Manager of the Whittington Gas-Works. They have expressed their appreciation of his services, and have granted him a superannuation allowance.

At Whitegate Parish Church, Cheshire, on Thursday last, in the presence of a brilliant gathering, Colonel Frank Pretty (T.D.), of Beacon Hill, Ipswich, late of the 4th Battalion Suffolk Regiment, was married to Miss Edith M. Dempster, of Vale Royal, Cheshire, younger daughter of the late Mr. Robert Dempster, J.P., the well-known gas engineer. In the Mid-Cheshire district there is no lady who has manifested a greater interest in public affairs than the bride. She was appointed in 1922 a Justice of the Peace in the Winsford Division; but this has been merely one of her public duties, as she has been for several years a member of the local Education Authority and a School Manager at Meadow Bank, which district adjoins the extensive park surrounding her historic home. Her marriage will rob Cheshire of a resident who has endeared herself to all classes. There were over 200 guests at the church; and the ceremony was followed by a reception at Vale Royal. The honeymoon is being spent in the New Forest. There were hundreds of presents, including gifts from the parishioners of Whitegate (where Miss Dempster was Vice-Chairman of the Parochial Council) and from the Newton Heath, Manchester, Mission (of which she was the founder).

We are informed that Mr. John Gifford Leonard and Mr. Julian Maynard Leonard have been admitted as partners in the firm of Carless, Capel, & Leonard, of Hope Chemical Works, Hackney Wick, E.

The Plymouth Corporation Gas Committee, meeting on Friday last, decided that the post held by Mr. R. C. Weekes as Engineer's Assistant be designated "Assistant Engineer."

OBITUARY.

Widespread sympathy is felt with Councillor R. W. Edwards, Chairman and Managing Director of the Aldershot Gas, Water, and District Lighting Company, and Mrs. Edwards, in the death of their only son, Mr. Reginald William Edwards. Aged 18 years last November, Mr. Edwards was being educated at Oundle, where he was head boy in the Headmaster's House; and it was there that he died on Wednesday last. He contracted influenza about five weeks ago, and complications set in.

Mr. J. H. Dingley, the Eastern Counties representative of the Davis Gas Stove Company, Ltd., in whose service he had been for nearly thirty years, passed away peacefully in his sleep on Good Friday. He had been ill for three months or more; but those about him thought the worst had passed, and to all appearances he was well on the road to complete recovery. His genial personality and sterling qualities had endeared "Jack" Dingley not only to his colleagues on the Davis staff, but also to all with whom he came into touch in his business. All who knew him will deeply regret his passing at the early age of 44. He was on active service during the war, having joined up voluntarily in the early days.

ELECTRICITY SUPPLY MEMORANDA.

Overloading the Industry.

Many men of high and honoured position in the electricity industry have spoken on the Government scheme; but their criticisms and warnings appear to fall like water off a duck's back so far as the electrically hypnotized Government are concerned. The name of E. Garcke stands in the industry for broad and considered views; and for them there is always the greatest respect. In a letter to "The Times," he states that the Bill of the Government intensifies the burdens and risks of electricity undertakings. There is no question about that. He also points to the intolerable interference by the proposed Central Board with the responsible management of selected undertakings, and the unfair competition by them with the latter. The terms of expropriation of undertakings are also described as grossly unfair, and an entire contravention of the rights conferred by Parliament, on the strength of which millions of capital have been raised. Another point which he makes is that the Bill attaches more importance to the relatively small economies which can be effected in the generation of electricity than to the savings that can be made by giving the industry greater freedom to take its product to market. In Mr. Garcke's opinion, all that is needed is to invest the Electricity Commissioners with additional powers to overcome the artificial difficulties which exist in the way of the present undertakers carrying on their trading. The scheme is one which overloads the industry with officials, capital, and whatnot. It is well to have, at this time, a record of the views on the Government scheme of men in high places in the industry. In the time to come, if the Bill goes through, it will be an interesting matter to see how the issues of political interference square with the prognostications of such competent men.

Mass Production.

An investigation has been made by Mr. F. Peake Sexton, A.R.C.S., A.M.I.E.E., of the statistics of existing generating stations, to ascertain the economy of mass production of electricity. The results have been published in the "Electrician;" and they do not put the super-power station so far ahead of smaller ones as to make it worth while to attempt to transfer those economies to consumers by indulging in a heavy cost for transmission. Mr. Sexton has tabulated the figures for all the municipally-owned stations for which returns are available, and has then ascertained the mean cost of generation in each case. The data are as follow:

Plant Capacity in kw.	No. of Stations.	Total Working Cost in Pence per kw.-h.		
		Min.	Max.	Average.
0- 500	12	1·81	5·01	3·31
500- 1,000	17	1·30	4·32	2·43
1,000- 2,000	32	1·19	4·01	2·23
2,000- 4,000	25	0·60	2·47	1·62
4,000- 8,000	37	0·86	3·52	1·48
8,000- 15,000	29	0·49	2·11	1·07
15,000- 30,000	28	0·56	1·89	0·97
30,000- 60,000	12	0·57	0·96	0·81
60,000-120,000	5	0·45	0·86	0·62
120,000-250,000	2	0·73	0·82	0·78

The table shows that while stations below 2000 kw. capacity are hopelessly inefficient, it is possible under suitable conditions for a station under 15,000 kw. to produce more efficiently commercially than either of the super-stations; and further, the five stations between 60,000 and 120,000 kw. are able to produce more cheaply than the two largest ones. Mr. Sexton deduces from this that one must not expect an enormous, if any, reduction in cost by the operation of the proposed Government scheme. There is naturally an enormous field for development in the region of small stations where the closing-down and the giving of bulk supply would be a great economy; but even here the bulk supply would involve a large outlay on cables. The Government seem to enjoy shutting their eyes to such facts as are disclosed by the data in Mr. Sexton's article.

80 p.ct. and 20 p.ct.!

Our friend the "Electrical Review" has seemingly been much agitated over the publication of the fact that the gas industry can claim for its processes an efficiency of approximately 80 p.ct., with heat used and lost in its processes amounting to about only 20 p.ct., part of which is recoverable in the shape of steam by waste-heat boilers, while the electricity industry can only claim in super working 18 to 20 p.ct. efficiency, with 80 p.ct. or more loss in the process of generation. In the argument of the gas people, our contemporary has discovered a serious snag, or thinks it has done so. It says that Dr. Carpenter stated, at the general meeting of the South Metropolitan Gas Company, that nearly 80 p.ct. of the energy of the coal they use is "passed-on" to the consumer in one form or another. The "Review" agrees that it is true that "nearly 80 p.ct. is passed-on to the consumer." But it inquires how much does he get out of it? It is noticed that our contemporary is very careful not to give a precise answer to the question. What it says is something vague. It is: "Seldom more than half as much as the gas engineer takes credit for, and often much less than that." We should like to know exactly what our contemporary means by those words. Let us assume that it is right that the consumer gets useful work representing about half of the heat energy passed on to him by the gas supplier. This would mean 40 p.ct. of the original heat energy of the coal; but as the electricity supplier—this in super-station working, and not in normal conditions—only passes-on about 20 p.ct. of the original heat energy of the coal, it follows that the consumer cannot possibly get more than that from the electrical energy he purchases. The "Review" says that electrical energy delivered to the consumer is in the most suitable form for complete utilization with negligible loss. Will our contemporary favour us and its readers by publishing the actual efficiencies of electricity used by the various appliances representing the application of heat energy to domestic service, in order to show the losses, for example, in the oven, on hotplates, water heating by the various methods, and so forth. Electricity has not yet come to the point where it can render all-round useful service with an efficiency of 100 p.ct.—and the "Electrical Review" knows this as well as anyone. In the same issue of our contemporary is an article by Mr. S. H. Penning, in which this pregnant paragraph appears: "The domestic electrical apparatus on the market to-day is far from being perfect, the public generally are unaccustomed to its use; a certain amount of education of the consumer and vigilance on the part of the manufacturer is necessary in order to avoid unnecessary expense and waste, and to make them as safe as possible in their every-day use. Probably most important of all is the question of the price of electrical energy for such purposes." That makes interesting reading in connection with the remarks of the "Review;" for there is much truth in it. Efficiency in use has relation to the cost of the B.Th.U. supplied. A pound of coal, having a heat value of 13,500 B.Th.U., will give in useful work in domestic heating about as much as the thermal energy of a unit of electricity, and so will 1 lb. of coke; and 29 units of electricity are required to equal the potential value of a therm of gas. Examine those figures in the light of *actual* efficiencies in use.

Municipal Wiring and Hiring.

The electrical contractors have recently been fighting local authorities in the Parliamentary Committee rooms; and municipal trading in electrical wiring and hiring of appliances has so far won the contest in both Houses. A Committee of the House of Lords have granted to the Colwyn Bay and Colwyn District Council powers for hiring and selling electrical fittings and apparatus and for wiring premises, in practically the same form as the authority granted last year to Bath, Burnley, and Barrow-in-Furness. The clause in these cases gives the municipal authorities power to engage in all this work without hindrance. In the Colwyn case, the matter was not fought altogether on the question of principle, though that was the ground upon which the local contractors themselves attacked the application of the Council. Evidence was given on behalf of the Council of certain defective work which had been carried out in the locality (including the crossing of gas-pipes by electric wires); but there was no proof that this was work which had been entrusted to recognized responsible contractors. The stronger part of the case for the Council was that the poorer class householders could not afford the initial expense of wiring premises and providing fittings, and that this militated against the development of electricity supply. However, as intimated above, the House of Lords Committee decided to allow the Council full powers. On the other hand, an application by the Doncaster Corporation met with a little variation by a Committee of the House of Commons, who apparently attempted to adopt a middle course, so as to give a measure of gratification to both parties. Complete hiring, wiring, and selling powers, together with hire-purchase authority, were sought. It was stated by a member of the Corporation Electricity Committee that 52,000 people out of 55,000 lived in houses of a weekly rental value of less than 10s.; and it was to deal with these that the wiring and fittings clauses were desired. The arguments adduced were very much the same as those in the Colwyn Bay case. The upshot was that the Committee decided to give the Corporation full selling powers, but resolved that the wiring should be done through contractors. Of course, these decisions may not be upheld when the Bills come before the other House. When the Guildford Corporation Bill was submitted to the House of Commons for second reading, an effort was made to expunge clause 52, which proposes to empower the municipal authority to sell electric fittings, and 53, which is intended to authorize the establishment of showrooms. The proposal was defeated by 100 votes for deletion, and 135 against. In this instance, the powers will now go to the Select Committee for adjudication; and in view of what has taken place in the cases of Colwyn Bay and Doncaster, the result will doubtless be the same.

The Ladies. The foundation of an Electrical Association for Women was noted in the "Memoranda" some time ago. The movement is developing by the establishing of branches in different parts of the country. Glasgow and Birmingham took the lead in the formation of provincial branches; and now a third one has been founded at Manchester. The purpose of these branches is to take a hand in propaganda work for the encouragement and advancement of the use of electricity in the home. The way in which it is conceived this can be effectively done is by the Women's Electrical Association supplying knowledge and information which otherwise housewives may not be able to obtain. The idea that there is a deficiency of knowledge and information in circulation which the Association can rectify, points to the view among the ladies that there is a want of efficiency in the methods which have been employed by electrical men in their propaganda work in regard to domestic electrification. Another ambition of the organization is to increase the part which women can take in the paid active work of the electricity supply industry. It is considered that there are many directions in which openings should be provided for intelligent and trained electrical women. Perhaps there is.

Trouble. We see that among recent electrocutions one has occurred at Hodgson's Tannery, Beverley, where Austin Burdon, aged 19, son of the chief electrician, was attending to an electric motor. He had been told by the foreman to let his father know that the motor would not start, but an hour later he was found dead near the machine. We also notice that Arthur Allsopp, age 34, a miner of Hucknall, Nottingham, was recently electrocuted while operating a coal-cutting machine. Recently, too, the Halifax Fire Brigade was called out to deal with an unkind incident. Over Corporation property at the bottom of Crossley Street, an electric sign has been installed by the Electricity Committee for the purpose of advertising the Department. It has done its work very effectively. From some cause or other the framework of the sign became ignited; and this demonstrated one of the abilities of electricity. A few days ago, at the New Cross Empire, a fire occurred in the electrical transformer room beneath the stage. The theatre was emptied in a few minutes, not only of its audience, but of the animals engaged in the circus performance which was proceeding. All the lights on the stage went out. In trying to extinguish the fire, the theatre fireman received constant electric shocks; but in the end he was successful.

INDUSTRIAL GAS SALESMEN'S CONFERENCE.

Programme of Meeting in Glasgow on April 28.

A programme full of interest and usefulness has been made up for the Industrial Gas Salesmen's Conference, which is to take place in Glasgow on April 28. The following are the full details of the arrangements:

Morning Session.

10.0 a.m.	Assemble at Head Office, Glasgow Corporation Gas Department, 30, John Street.
10.30 a.m.	Party arrive at 24, Walls Street, for inspection of industrial appliances.
11.15 a.m.	Lecture Theatre, "Notes on the Application of Town Gas for Industrial Heating," by Mr. J. McIsaac, Glasgow. Discussion.
12.30 p.m.	Close of Session.
1.0 p.m.	Luncheon in the Trades House, Glassford Street, at 3s. 6d. per head, to be paid for in the luncheon room.

Afternoon Session.

2.0 p.m.	Party will re-assemble in Wilson Street, opposite Trades House, and will divide into two groups.
	Group 1.
2.15 p.m.	Motor leaves for visit to the Albion Motor Car Works, South Street, Scotstoun.
3.15 p.m.	Leave above works.
3.45 p.m.	Arrive at Messrs. Macfarlane Lang's Biscuit Factory, Mackinfauld Road, Tollcross.
4.30 p.m.	Leave above works.
5.0 p.m.	Arrive George Square.
	Group 2.
2.15 p.m.	Motor leaves for visit to Messrs. Macfarlane Lang's Biscuit Factory, Mackinfauld Road, Tollcross.
3.15 p.m.	Leave above works.
3.45 p.m.	Arrive at the Albion Motor Car Works, South Street, Scotstoun.
4.30 p.m.	Leave above works.
5.0 p.m.	Arrive George Square.

Iron and Steel Institute.—The annual meeting of the Institute will be held at the Institution of Civil Engineers on Thursday and Friday, May 6 and 7. Among the papers to be read are "Coal Blending," by D. Brownlie; "Notes on the Combustibility of Coke, and Direct Reduction in the Blast-Furnace," by W. W. Hollings; and the "Influence of Segregation on the Corrosion of Boiler Tubes and Superheaters," by G. R. Woodvine and A. L. Roberts.

FORTHCOMING ENGAGEMENTS.

[Secretaries of Gas and Kindred Organizations are asked to assist in making this diary of events as complete and useful as possible by sending the earliest intimation of all meetings.]

April 17.—Midland Junior Gas Association.—Visit to the Old Kent Road Works of the South Metropolitan Gas Company.
April 17.—Yorkshire Junior Gas Association.—Visit to Messrs. Brotherton & Co., Ltd., at Stourton.
April 17.—Scottish Junior Gas Association (Eastern District).—Annual general meeting at Edinburgh.
April 17.—Wales and Monmouthshire Junior Gas Association.—Annual general meeting at Newport (Mon.).
April 20.—Southern Association of Gas Engineers and Managers (Eastern District).—Meeting at the Royal Hotel, Winchester, at 2.30.
April 21.—British Horological Society.—Lecture by E. H. Horstmann, on "Clockwork Gas Controllers."
April 23.—London and Southern District Junior Gas Association.—Meeting at Westminster Technical Institute.
April 28.—Industrial Gas Salesmen.—Meeting at Glasgow.
April 30.—"B.C.G.A.," Scottish Conference.—Perth.
May 5.—Society of British Gas Industries.—Annual general meeting at the Hotel Cecil, under the presidency of the Rt. Hon. Sir Alfred Mond, Bart., M.P.
May 6.—Eastern Counties Gas Managers' Association.—Spring meeting at Ipswich.
May 6.—Midland Association of Gas Engineers and Managers.—Spring general meeting at Dudley.
May 6-7.—Iron and Steel Institute.—Annual meeting at Institution of Civil Engineers.
May 7.—North of England Gas Managers' Association.—Annual general meeting in the County Hotel, Newcastle-upon-Tyne, at 2.30.
May 7.—Chemical Engineering Group of the Society of Chemical Industry.—Annual general meeting at the Florence Restaurant, Rupert Street, W. 1, at 6.30.
May 8.—Manchester and District Junior Gas Association.—Visit to the Blackburn Gas-Works.
May 14.—Southern Association of Gas Engineers and Managers.—Visit to Bristol.
May 14.—"B.C.G.A.," Manchester District Conference.—Buxton.
May 18.—"B.C.G.A.," Cheshire and North Wales District Conference.—Wallasey.
June 1.—National Gas Council.—Annual general meeting.
July 19.—Institution of Chemical Engineers.—Annual meeting.
Sept. 9.—"B.C.G.A.," Midlands District Conference.—Smethwick.

Institution of Gas Engineers.

May 11.—Advisory Committee on Education.
May 12.—Benevolent Fund, Finance Committee, Emergency Committee.
May 19.—Gas Investigation Committee.
June 7.—Council.
June 8-10.—Annual Meeting.
June 11.—Visit to Hastings.

Society of Chemical Industry (Birmingham and Midland Section).—On Tuesday, April 20, the Society will hold a joint meeting at Birmingham with the Chemical Engineering Group. In the afternoon the party will visit the Soho Foundry of Messrs. W. & T. Avery, Ltd. Dr. D. T. Twiss (Chief Chemist to the Dunlop Rubber Company) will preside in the evening, and will be supported by Mr. C. S. Garland, Chairman of the Chemical Engineering Group. The following papers will be read: "Measuring and Weighing Apparatus as Applied to Chemical Works," by W. A. Benton (Head of the Research Department of Messrs. W. & T. Avery, Ltd.); and "Rotameters in Chemical Industry," by W. Hall-Simons, A.I.C., and F. C. Sutton, B.Sc.

Hand Calorimeter.—The principle involved in the Dr. Strache-Kling hand calorimeter (of which the Alpha-Lux Company, of New York City, are the American agents) is the burning of an air-gas mixture, of a known quantity of gas with a definite volume of air, in an explosion pipette insulated by means of a Dewar vacuum jacket. The temperature rise is recorded on an inserted thermometer; the instrument being equipped with a computing table. Each apparatus has three different sized measuring pipettes—a large one for producer gas, a smaller one for blue gas, and the smallest for town or coal gas. These are readily interchangeable. Producer gas, if very low in calorific value, may require the addition of hydrogen; and in this case a correction must be made for it. Among the advantages claimed for the apparatus are that it is portable (the weight being under 10 lbs.); it is accurate; it requires only small quantities of gas for each determination; it requires no water connection; it can be operated by anybody without special training; and a determination can be made in one minute.

ELECTRIC WELDING OF GAS-WORKS PLANT.

At the 1923 Convention of the Canadian Gas Association, which was held in Ottawa, Mr. Joseph N. Reeson, Engineer-in-Chief to the Metropolitan Gas Company of Melbourne, presented a paper on "The 'Quasi-Arc' Welding of Gasholders" which was reprinted in the "JOURNAL" for Oct. 24 of that year. In this he described the erection of a new holder at the South Melbourne Works (to take the place of a 3 million c.ft. one which had collapsed in 1920), and also the building of one at Fitzroy, which was commenced on completion of the South Melbourne holder. So far as gasholders were concerned, he claimed that these were the first two fabricated with welded joints, not only in Australia, but in the world.

The first experiments in welding were confined to the jointing of sheets; and for some time oxy-acetylene welding was employed. This, however, was ultimately discarded as unsuitable, largely owing to the difficulty of overhead welding. Attention was then directed to the use of electric welding; and the process eventually adopted was the one known as the "quasi-arc." From the tests, the tensile stress of the joints made was invariably found to be equal to, if not greater than, that of the sheets themselves. The training of the welders had to be undertaken by the Company's own staff.

In the case of the South Melbourne holder, the crown sheets, as well as all the side sheets, are welded; and in this structure there are 15 miles of welding, in which not more than six leaks were found when tested. The Fitzroy holder is a somewhat smaller one than the South Melbourne; and in view of the success already achieved, this was constructed exclusively with electric welding. On completion, it was subjected to rigorous examination, and proved to be, if anything, a more effective piece of construction than the South Melbourne holder; not a sign of a leak was anywhere discerned.

Since that time other work of a similar character has been undertaken, reference to which was made in a recent issue of the "Engineer," based on information received from the Quasi-Arc Company, Ltd., of 15, Grosvenor Gardens, London, S.W. At the same time, and from the same source, our contemporary reproduced photographs of an electrically welded gasholder under construction and of electrically welded water-lute purifier covers. As to the holder illustrated—a 1 million c.ft. structure—it was pointed out that the new tank fits into the old brick tank of a holder previously on the site. It was built at ground level, and was lowered by eight screw jacks as each belt was completed. The most notable features of this work are, first, the fact that it was not found necessary to drill or punch a single hole for the manufacture or erection of the tank or its fittings; and, secondly, that the edges of the plates were used as cut by the shears. The joints, both vertical and circumferential, are lapped and welded inside and out; and the tank as built is truly cylindrical.

Much more information on the interesting subject of electric welding on gas-works and the construction of gasholders was contained in a paper written by Mr. Reeson, which was submitted to the Institution of Civil Engineers at a meeting in Great George Street, Westminster, S.W., last evening. By the courtesy of the Institution, we are enabled to place before readers the following abstract of this paper. In it, the author describes some of the work done by him, and indicates the influence of welding on design.

INFLUENCE OF ELECTRIC WELDING IN THE DESIGN AND FABRICATION OF PLANT AND STRUCTURES.

In the opening sentences of his paper, Mr. Reeson expresses the opinion that the time is not far distant when electric welding will take the place of the older method of riveting in most applications. The employment of welding in place of riveting, however, without due consideration to special design, is likely to prejudice the new method of jointing, and to give rise to erroneous opinions as to the advantages of its application. The principal doubts hitherto expressed have been with regard to strength in actual practice, the effect of corrosion on the weld and the welding deposit, and the cost of welding in comparison with that of riveting.

The quality of a weld depends very much upon the skill of the operator; and this is one of the great difficulties that the engineer has to face. At the inception of the adoption of welding, much difficulty was encountered by the author owing to the impossibility of obtaining the services of trained welders; and therefore men from both the artisan and labouring classes were trained in the Company's own workshops. Important as was the training of the welder to ensure an absolutely safe weld, it was still more important that the joint should be designed with as much care as would be given in the case of a riveted connection. Hundreds of tests on all types of welded specimens were carried out in the testing laboratory of the University of Melbourne; and the operators were frequently present at the testing of the specimens they themselves had welded. After their first visit to the laboratory, the quality of the welds was greatly improved. Now the Company have as full a knowledge of the requirements of a welded joint as of a riveted connection.

Having, however, trained the welders, there still remained to be considered the most important factor—that of the designing staff. The economics of welding are bound-up in design; and a capable designing staff may enable great savings to be effected. These economies are not obtained at the expense of the safety of the structure; for it can now be confidently expected that the joint is at least as strong as the plate or section being joined. With the use of welding, simplification of design follows. As an instance of this, Mr. Reeson cites the construction of a steel tank 102 ft. in diameter by 17 ft. 6 in. deep, in which the only shop operation was to put such plates as required rolling through the rolls; the plates being used practically as they arrived from the mills.

GASHOLDER CONSTRUCTION.

The causes which led-up to the adoption of welding by the author date from 1916, when an extensive programme of gasholder construction became necessary in Melbourne. Four years later, there was the collapse of one of the Company's holders, of 3 million c.ft. capacity. [A photograph of this holder (which was built in 1890) in its wrecked condition will be found on p. 777 of the "JOURNAL" for June 22, 1920.] The finding at a Government inquiry was to the effect that this collapse was due to strain caused by temperature changes. The evidence given stated that a noise was heard resembling a gunshot, and that immediately the thin crown sheeting ripped off close to the strong plates near the curb, and folded back; the released gas becoming ignited. The framing of the holder was practically undamaged. Mr. Reeson was impressed by the fact that invariably the fracture of the crown sheeting was not through the rivet holes of the seams, but at the lap of the sheets, which were of iron, 10 B.W.G. ($\frac{1}{8}$ in. thick), single riveting $\frac{3}{8}$ in. diameter, $1\frac{1}{4}$ in. pitch, with tape in seams. Extensive corrosion had taken place internally; and particularly was this accentuated at the laps of the joints, due to the bending movement and to the accumulation of moisture at this point.

The serious weakness which had arisen in the laps of the outer rows of the crown sheets indicated the defect in the design of this, or of any similar holder. The crown curb of the gasholder is in effect a horizontal ring strut, strong enough to support the weight of the holder hanging from it. It has also to transmit into the crown the stress due to the weight of the holder. The crown sheeting is in simple tension amounting to 6700 lbs. per lineal foot. This thin sheeting, in tension, is connected directly to the curb in compression; and the change in the character of the stress apparently takes place somewhere near the junction. The crown curb and sheeting are subjected to varying stresses according to the number of lifts hanging from the sides; and these changes may occur several times a day. It therefore seems reasonable to the author to assume that this continued movement, aided by the effects of corrosion, helped to weaken the laps on this line.

Considerable evidence was found of the formation of prussian blue; and the sheets were much wasted by this corrosion or by oxidation. The vertical stays of all lifts, originally none too strong, had corroded badly, and in many cases were non-existent. This was particularly noticeable in those formed of curved plates in the inner lift. In those of the middle lift, formed of 8 in. by 3 in. channel bars, serious deformation had occurred during the descent of the holder. The exterior of the sheets had been well preserved. The design of the structure generally was of the type usual to the period. No roof trussing had been employed; but a timber framework in the tank had been provided to support the crown of the holder when empty. A close study of the condition of the structure and the sheeting convinced the author that the ordinary accepted practice did not allow a sufficient margin of strength—especially at the joints—with the result that he determined to endeavour at least to overcome the weakness shown in the jointing. Extensive experiments with electric welding showed that the strength of a welded joint was at least equal to that of the sheet, as compared with a 55 p.ct. strength of the single riveted joint; and tests to determine whether the joint was more or less subject to corrosion than the sheet were also satisfactory. This decided Mr. Reeson to proceed with the construction of the holder bell; special plant being designed in the Company's drawing offices and made in their workshops for erecting the structure.

When the bottom curb had been lowered on to the rest blocks, special vertical stays were erected, consisting of three channels, one 9 in. by 3 in., and two 2 in. by 4 in. section. It is the opinion of the author that most vertical stays are inherently weak, since, owing to the necessity of leaving some clearance for the lifts to work one within the other, the space allotted to them is very constricted. The stays should be designed as columns supporting the structure of a lift. It was compliance with these conditions which led to the rather unusual design that is now the standard practice of the Company. This design was employed for the outer and middle lifts; but very much heavier stays were provided for the inner lift. The side and crown sheeting was of 9-64ths in. thickness, and the sheets

nominally 8 ft. by 4 ft. in size; but much larger sheets would be preferable in a welded structure. In every case both sides of the lap were welded. The advantage of the welded joint in doing away with the taping is important—particularly in countries subject to considerable heat and to sudden severe changes of temperature. The holder has worked very satisfactorily since being put into commission.

Next followed the Fitzroy 2¾ million c.ft. four-lift holder, on which electric welding was employed exclusively. This was constructed and erected in ten months, without any evidence of a leak on completion. The third holder to be constructed was a single-lift one, at the Richmond out-station, and the fourth a 1 million c.ft. holder at the Fitzroy station. In the case of the last-named, the greatest departure from present-day practice is in the guide framing, which consists of twelve bays of standards and bracing, and five tiers of horizontal struts. The standards and struts are built of steel tubes; and the whole is so welded as to form a very stiff structure. The standards are 145 ft. in length, 18 in. in diameter in the lower three tiers, and 15 in. in diameter in the two upper tiers. The struts are 15 in. in diameter in the three lower tiers, and 12 in. in diameter in the two upper tiers. The metal is ¼ in. thick throughout. Other of the Company's holders have been repaired by welding.

A serious accident occurred to the inner lift of another large gasholder while a repair to the sheeting was being effected, whereby the gas caught fire and the side sheets of the inner lift were opened-up. The inner and the middle lifts were attached together by the welding of 72 hooks to the crown curb of the inner lift and hooking them under the dip plates of the second lift. The space between the lifts was covered in by thin sheeting welded in place. The whole work occupied three weeks and was entirely satisfactory.

As the crown of any holder is the most vulnerable part, Mr. Reeson spent a considerable time in studying the best means of protection. As the result there has been applied to three of the oldest of the Company's holders a design consisting of a number of circumferential rings connected together by radial bars; the whole lying loosely on the crown sheeting, except at the outer ends of the outer radial bars. These are welded-down to the crown curb; and the sheeting is thus enclosed in a steel net. The net must relieve the sheeting of a great deal of its stress; and it was designed to take two-thirds of the load.

Other Applications.

The paper includes also an account of a number of other applications of welding to the Company's plant. In a vertical retort house at the West Melbourne works, the whole of the columns, struts, beams, roof trusses, and conveyor tracks, the chimneys, and a set of overhead coal bunkers were welded; and further work of the same kind is in hand. In connection with a 3 million c.ft. capacity set of purifiers, a large monetary saving has resulted from the adoption of the same process. Water tube condensers, tar extractors, ammoniacal liquor concentrating plant, liquid flotation purification plant, &c., are now all being carried out in welded steelwork. The author cites a combined gas main and footbridge as a concluding example of a system which, he says, offers: First, much greater security than riveting; and, secondly, such remarkable results in the simplification of design in the office and such great economies in the field and workshop, that it is surprising its use has not been employed to a greater extent.

Causes of Reactivity and Inactivity in Cokes.—Addressing the Glasgow Section of the Society of Chemical Industry, Mr. R. Maclaurin pointed out that cokes vary in reactivity, in percentage of volatile matter, and in specific gravity; and there appears to be no connection between these properties. When slowly heated below 700°, coal produces a black coke of high reactivity; whereas an increase of temperature to 750° or 800° yields a grey coke of poor reactivity. The conversion from a black to a grey coke takes place within a narrow range of temperature, and is accompanied by the formation of a glassy film. The loss of reactivity was attributed to the formation of "glass," and an accompanying reduction in porosity. The address is abstracted in the "Journal" of the Society.

New British Standard Specifications for Paint Materials.—The British Engineering Standards Association have issued specifications for genuine dry white lead and genuine white lead oil paste for use in paint manufacture. They contain clauses regulating the composition, together with standard reception tests for the purchase of genuine white lead in dry and paste form respectively, and appendixes giving methods of carrying out the tests. These specifications have been prepared at the request of the paint manufacturers by a Committee representative of both the buying and manufacturing interests, and are the first to be published of a series of specifications for paints, varnishes, and paint materials. As in the case of all British Standard Specifications, they will be reviewed as experience of their working or progress in the industry renders it necessary, and revised isues will be published from time to time. Copies of the new specifications (Nos. 239 and 241, 1926) can be obtained from the B.E.S.A., Publications Department, 28, Victoria Street, London, S.W. 1; price 1s. 2d. each, post-free.

PITCH SPECIFICATIONS.

The Position from the Briquette Makers' Point of View.

A short time ago reference was made in the "Journal" to the complaints of briquette makers of the binding qualities of vertical retort pitch. The matter has been one of frequent reference in the columns of the "Iron and Coal Trades Review." The last article on the subject deals with the question of pitch specifications, and the producers of pitch will be interested in knowing precisely the position of this matter from the briquette makers' point of view. Our contemporary states that competition has compelled the briquette makers to adopt stringently precise specifications for pitch, it being only within recent years that the majority of them have known any standard test whatever for (say) medium soft pitch. Rough and ready tests were formerly adopted; but now there is a more definite gauging of the physical properties.

Numerous test innovations have been suggested, but in most of them the personal factor has been present, and has been a disturbing element; but in the more modern "melting-point" methods the personal factor has been eliminated. The article described some of these methods, such as the "water melting-point" and the "air melting-point." The test in favour at present, though by no means new, is that of Kraemer and Sarnow. In this, pitch is drawn up while molten into a glass tube of specified dimensions, and a definite weight of mercury is poured on top when the pitch has solidified. The tube and contents are then heated in water, and the melting-point is taken as that temperature at which the mercury drops through the pitch. A variation of this test is known as the "ring and ball" method, in which a steel ball is substituted for the mercury. The greater convenience of this test has led to its general adoption. This is stated to represent the present stage of accuracy in recording the hardness of any pitch, a property of pre-eminent importance to the briquette maker.

With the introduction of vertical retorts, however, and the difficulties encountered in using this particular type of pitch for briquetting, it is not the only factor; and it has been found necessary to formulate other specification items. Deemed to be of paramount importance by some users is the volatile matter. In the case of vertical retort pitch this is much higher than the average, reaching 70 to 75 p.ct. as compared with 55 to 65 p.ct. in other grades. The free carbon content has also become important; but since it is the custom of some producers to add "fillers" to pitch during manufacture, it is not always advisable to assume that pitch is good because it is high in free carbon. The article points out that there is a very uncertain relationship between the free carbon figure and the binding power of the pitch. It is, however, interesting to note that vertical retort pitch contains less than half the free carbon present in a coke oven pitch of the same degree of hardness. So far as hardness is concerned, the briquette maker can be reasonably assured of uniformity of supplies of coal tar pitch, but he cannot be so certain of similar satisfaction from the point of view of binding power unless, the writer asserts, he leaves vertical retort pitch severely alone. But this is almost an impossibility, in view of the present shortage of supplies. Regarding the binding power of a pitch, it is stated by our contemporary that there is no sure way of judging the suitability of any pitch for briquetting other than by a practical test on a works scale.

The article proceeds to state that one of the most promising tests for ascertaining the value of a pitch to a briquette maker is that known as the sliding test. In this (quoting from the article):

> A small cylindrical mould of pitch is fixed side by side with a similar mould of a standard pitch, on an inclined piece of corrugated metal, and the whole is enclosed in some suitable air vessel whose temperature is raised to about 100° C. After a convenient period, the amounts of flow are measured and the nature of the fluid pitch is examined. The better the pitch from a briquetting point of view, the longer will be the smear, provided, of course, that the respective pitches are of the same "melting-point." The relative lengths of flow are indicative of the relative values. If a "filled" pitch be tested in this way, the fact of its being so treated is evident on examining the smear, a characteristic dulness or even grittiness being apparent. Horizontal and vertical retort pitches produced under analogous conditions from the same coal, when tested in this way, show a 10 p.ct. longer "run" in the case of the horizontal pitch; and this is approximately the difference in efficiency as a binder in briquetting.

Towards the close of the article it is pointed out that a hopeful feature of the problem of vertical retort pitch is that it is fundamentally altered when treated with certain chemicals—the resulting product comparing very favourably with other kinds when examined by any of the described tests. It is stated that some secrecy is being observed in this matter; and it remains to be seen whether these chemically treated products will survive a practical trial. The hope is expressed that some tangible results of this study of vertical retort pitch will be forthcoming before the next pitch season, as otherwise briquette makers will have seriously to consider the more general adoption of the newer types of binders which are being introduced.

COKE AND COKE STRUCTURE.

[Extracts from a paper by H. Kerr, A.I.C., Diploma, Fuel and Metallurgy (Leeds), before the Coke Oven Managers' Association (Midland Section) on March 20.]

To capture the domestic market, a coke should be low in moisture and ash, of medium specific gravity, high combustibility, and high resistance to crushing, and should have a volatile content to 4 to 5 p.ct. evenly distributed throughout. It should have a low ignition temperature, and must burn easily, be clean, even in size, and not susceptible to easy weathering. The most important factor affecting the quality of coke is the constitution of the original coal.

In a coke oven, at a temperature of 350° to 450° C. (dependent upon the type of coal) the layer in contact with the wall becomes pasty, and swells. This pasty layer is in a state of violent ebullition due to the expulsion of volatile matter (gaseous and liquid), and progresses into the interior of the charge, from each wall, until the two layers meet at or about the centre of the oven. After the expulsion of the major portion of the volatile matter, the mass hardens, and retains essentially the cellular structure developed at the end of the pasty stage. As the pasty layer travels across the oven, the gases and vapours evolved pass off, taking the line of least resistance, some of them passing through the uncarbonized charge and some through the hot coke. The hydrocarbons which pass through the hot zone undergo to a certain extent partial secondary decomposition, and deposit carbon on the cellular surface, thereby building-up and strengthening the coke. The actual thickness of the pasty layer is most probably very small, but the drop in temperature across it is undoubtedly very great, and the interior of the charge remains comparatively cool for a long period. As the coking progresses, cracks develop in the charge which form passages and cleavage planes for the escape of a large percentage of the gases evolved; and hence the amount of deposited carbon is greater in proportion along these planes than in the interior of the solid masses of coke. When the pasty layers have finally merged at the centre of the charge, and the volatile matter has practically all been driven off, the coking is then considered complete. There is generally a distinct vertical parting in the centre of the charge, where the structure of the coke is usually more open and is sometimes even spongy. The exact position of this parting is determined by a large number of factors, such as the blending, sizing, and mixing of the charge, and the method and evenness of heating. During the plastic stage, especially with strongly coking coal, the expansion of the charge may develop large forces. As the carbonization proceeds, contraction takes place in the charge, until after a certain time the force of contraction will overcome that of expansion. This will naturally be towards the end of the coking period, when the force will be sufficiently large to cause a cleavage along the plane of least resistance—that is, along the plane of convergence of the two plastic layers. A vast amount of work has been done and is being done on the prevention of the formation of this plastic layer, by blending highly coking coals with an inert material or with non-coking coals.

The examination of the natural surfaces of the coke forms an interesting study. The colour may be looked upon as relatively unimportant. In a completely carbonized charge it depends mainly upon the method of quenching, for excessive water quenching gives a dark coloured, dead-looking coke, while careful quenching of the same charge would yield a light grey coloured coke. Some coals, such as Durham coals, will give a silvery-grey coke, while cokes from inferior coking coals will have a dull black colour. This silver-grey colour is usually attributed to the decomposition of the methane in the gases evolved, resulting in the deposition of carbon.

No definition of coke would be complete which did not take cellular structure into account, but great care must be taken in describing the structure, as it may vary greatly in one specimen. Lately, greater and greater importance is being attributed to cell structure, but the subject has not until recently received much attention; and no standard has been defined. Ramsberg and Sperr attempted to standardize the cell structure, basing their standard on the average size of cell, together with the general type of structure of the coke, whether it be regular or irregular with regard to the cell arrangement. The authors emphasized the fact that the thickness of the cell walls should be noted. Thus a coke of close texture with thin cell walls may have the same percentage of cell space or porosity as another coke having large cells and relatively thick walls. It is the cell walls and surfaces which are most important; cell space and porosity are merely incidental. The preparation and examination of coke sections opens up a large and interesting field for research, but it is essential to be well acquainted with the history of the sample before commencing. One branch of this work, dealing with the actual chemical and physical state of the coke produced from various types of coals, together with gas, tar, and other bye-product yields, is being investigated by the research staff of the Joint Committee of the University of Leeds and the Institution of Gas Engineers. The effect of finely-divided mineral matter on the properties of coke has also been brought forward by Lessing, and emphasized in an interesting paper by Marson and Cobb.

The relationship between cell structure and some of the properties of coke has of late years received a certain amount of attention, but the whole subject bristles with difficulties, the solutions of which are even now nowhere near finality. Beilby, after a careful study of the subject, concludes that "coke structure, however minute, is due to the evolution of gas bubbles from fused or partially fused coal substance." He states that coke is formed in the following stages:

(1) Fusion of the coal forms a plastic foam in which the bubbles of gas formed at this stage are each a self-contained cell.
(2) By the mutual perforation of these bubble cells at their points of contact, a sponge is produced through which the gases escape to the outside of the mass.
(3) With increased temperature there commences the formation of a rigid spongy mass, in the walls of which, by further decomposition, more minute cells are produced.

This formation of more and more minute pores proceeds until all the volatile matter has been driven off.

Foxwell, Illingworth, and others have also contributed valuable and interesting data regarding the mechanism of the carbonization of coal. Foxwell has recognized the significance of the rate of heating—a fact which must be borne in mind when considering theories applied to large-scale industrial processes.

Greenwood and Cobb examined cokes made at different temperatures, paying special attention to the relative specific gravities and porosity. They agreed with Beilby in the modification of the cell wall structure, and state that these secondary reactions, though modifying the cell structure, do not alter its fundamental character. The authors point out that these modifications may have technical importance. An examination of cokes produced at 550°, 850°, and 1100° C. showed that the period up to 550° C. was one of intense cell formation, accompanied by a swelling of the mass. The cell walls at this stage were relatively thick, consisting of soft material having a specific gravity higher than the original coal, but lower than the higher temperature cokes. Between 550° and 850° C. further evolution of gas was observed, with a corresponding decrease in the mass and volume of the coke material. The shrinkage amounted to 11·4 p.ct., while the density of the coke material increased from 1·591 to 1·870. The cell walls became thinner and stronger, and the maximum value for porosity was obtained. The increase in specific gravity was probably due to the graphitization of the carbon. From 850° to 1100° C. there appears to be no appreciable increase in specific gravity of the coke material, but a further shrinkage of 11·4 p.ct. occurs in the volume, with a fall in porosity to 45·8 p.ct. The cell walls had thickened considerably, giving relatively small cells. This, together with deposition of carbon from methane, probably accounts for the increase in strength.

Foxwell, in carrying out experiments on "The Plastic State of Coal," confirmed to some extent the above results. He carbonized coals at different temperatures, and found that the cokes made at 400°, 500°, 600°, and 700° C. were soft, whereas the 800° and 900° C. cokes were hard. The hardening of the coke appears to occur, therefore, between 700° and 800° C.—a temperature at which all the coke-forming constituents had been driven-off or destroyed. The change therefore appears to be essentially a physical one. In these experiments all the tar formed had been removed from the coke below 700° C.; and therefore any possibility of this source being the cause may be ruled out. Burgess and Wheeler have pointed out that "between 700° and 800° C. there is a well-defined decomposition point, which corresponds with a marked increase in the quantity of hydrogen evolved." It is conceivable that the coke up to this stage consists of organic compounds rich in carbon, which are stable up to these temperatures, and at a point between 700° and 800° C. these complex compounds decompose into carbon and hydrogen. The liberated carbon being of a graphitic nature would be much harder and stronger than the pre-existing hydrocarbons.

Recently Sutcliffe and Evans have made a study of the influence of the structure on the combustibility of solid fuel, and have drawn some very interesting conclusions.

The process of combustion must be essentially a surface reaction; and therefore the area of surface presented to the oxidizing or reacting atmosphere is most important. The combustion can only proceed if this incandescent surface exposed to the atmosphere is sufficient to overcome heat losses by radiation, convection, and conduction, and maintain the adjacent fuel at a temperature above its ignition temperature. This area of surface is a function of cell structure; and in general, other things being equal, the greater the area of surface of a fuel, the greater will be its degree of combustibility,

especially if the walls of the cells are thin. Wood charcoal has a highly developed cell structure, and is well known for its degree and ease of combustibility. The ideal to aim at is large surface exposed by innumerable small pores, and not a comparatively small surface of large pores and thick cell walls. It is apparent, therefore, that porosity plays a secondary part in the combustibility of a fuel, for it is possible to have two fuels of equal percentage porosity, but having totally different degrees of combustibility. The one fuel may have large cells and thick walls, whereas the second, and more combustible, fuel would have a large number of small cells, and therefore correspondingly thinner walls. Thorner, from his thin sections, concluded that coke consisted of relatively massive walls and large cells; the actual coke substance being "an extremely close impermeable glassy mass." Anderson from his work also concluded that the cells were vitrified and gas-tight. The cells themselves are to a certain extent the petrified picture of the size of the gas bubbles evolved at the end of the plastic stage; and those gases were evolved from the coke. For this to take place, a passage must have been formed, possibly by the interconnection with other cells or again by the direct escape of the gas bubble itself. After the release of the gas, however, secondary reactions may occur, bringing about decomposition of the hydrocarbons. This decomposition may take place inside the cells, and may bring about a diminishing or total stoppage of this passage. With high-temperature carbonization, the tendency for these secondary decompositions will be increased; and there is evidence in some coke structures of the cells being filled with deposited carbon. It must be remembered that, to ensure combustion, there must be free circulation of the oxidizing atmosphere and also of the products of combustion; and therefore any cells which have their surfaces unbroken or with very small interconnecting passages will tend to stop this circulation. Sutcliffe and Evans, however, believe that the reactive surface brought about by small pores increases the rate of combustion so much that it more than compensates for any loss of internal circulation. These investigators, in stressing the importance of the porosity of the cell walls, point out that the question of porosity may be looked at from two standpoints:

(*a*) Cell space per unit volume.
(*b*) Cell space per unit mass.

Thus an exceedingly voluminous coke may contain a large number of cells per unit mass, but, owing to its low apparent specific gravity, only a few large cells per unit volume. A dense fuel containing a large number of cells per unit mass is essential.

It should be borne in mind that our knowledge of the exact factors governing combustibility and reactivity is not all that could be desired, and it is highly probable that the question of size of pores and thickness of cell walls is not the only matter of import which governs these properties. As previously mentioned, it has been pointed out many times that the ash constituents in the coal itself may play an important part in deciding the structure and physical properties of the coke produced on carbonization.

The powdering and blending of the coal prior to carbonization will tend to distribute the ash constituents evenly throughout the mass; and this may be one of the important factors governing certain properties of the various cokes.

CHEMICAL TOPICS FROM CURRENT LITERATURE.

Notes on Recent Technical Publications.

By H. J. Hailstone.

Ammonia Extraction.

A knowledge of the vapour pressures of mixtures of ammonia and carbon dioxide in water at different temperatures gives a basis for calculating the theoretical amount of water required in washing-out in strongest form the ammonia from a gas which contains a given proportion. From experimentally obtained data, R. Mezger and T. Payer have worked out a series of graphs which enable the desired information to be quickly obtained. These graphs, and a full account in "Das Gas- und Wasserfach," are worthy of note.

Gas Analysis.

A gas circulating apparatus is described in the "Journal of the Chemical Society" by Pearson and Thomas, of the South Metropolitan Gas Company. It utilizes the principle of the hot air engine, the cylinder consisting of a gas-heated glass bulb, while the piston is a U-tube, the further end of which is fitted with glass inlet and exhaust valves. The apparatus depicted and described has a capacity of two to three cubic feet per hour. Another apparatus for the same purpose has been devised by Chatterjee and Finch. This utilizes mercury traps instead of valves, and a motor-driven plunger is employed for creating the oscillation of the mercury in the U-tube.

The "Journal of the Society of Chemical Industry" publishes J. Yoe's arrangement for measuring flow of gases. A short capillary glass tube is cemented to a metal disc which may be coupled-up in parallel with a U-tube manometer by special metal couplings and rubber washers. The initial calibrations are made by aspirator tests with a suitable liquid in the U-tube. In this connection, R. Foster recommends, in the "Journal of Industrial and Engineering Chemistry," oil of wintergreen as a good medium for use in flow meters, since it does not evaporate at ordinary temperatures, nor is it affected by possible traces of grease adhering to the tube.

The "Zeitschrift für Angewandte Chemie" contains F. G. Hoffmann's recommendation of the use of brine as a good confining medium. Carbon dioxide is only slightly soluble in the suggested liquid, which offers advantages over dilute sulphuric acid. The use of mercury in gas analysis necessitates periodical cleansing and purification; and the method of A. S. Russell and D. C. Evans for quickly carrying-out this task is given in the "Journal of the Chemical Society." Oxidation of the impurities is the basis of most of the methods for cleaning mercury, and nitric acid and air have long been employed. The new method utilizes acid permanganate solution, with or without addition of ferric sulphate. Its advantage lies in the fact that removal of impurities is rendered evident from the appearance of the surface of the mercury after sufficient treatment, while little of the pure metal need be lost in the process.

G. Werner gives in "Zeitschrift für Angewandte Chemie" a method of gas analysis based upon observations of refractivity. The necessary apparatus is described, together with details regarding the calibration of the instrument using carbon dioxide as the standard.

A selective absorbent for ethylene in the presence of saturated hydrocarbons appears in "Brennstoff Chemie," where Tropsch and Dittrich recommend a dilute solution of silver sulphate with nickelous sulphate in strong sulphuric acid. Liquid air is made use of in cooling gas mixtures for separation of the constituents by subsequent fractional distillation *in vacuo* and absorption by various special reagents.

Analytical Methods.

Sulphur determinations in coals are quickened by the method of Komorowski and Kozon, described in "Chemisches Zentralblatt." A small weight of the powdered coal is mixed with sodium carbonate and an oxidizing agent—in this case potassium permanganate—and heated in a crucible gradually to incandescence. While heating proceeds, the mixture is stirred with an iron rod, and after an hour may be cooled and dissolved in the usual way, and the sulphur estimated as sulphate.

Apropos crucibles, J. Main Smith describes in a recent "Journal of the Society of Chemical Industry" a new type of interior-fitting serrated lid for crucibles. By its employment it is claimed that more accurate results may be obtained in gravimetric analytical work. With the new type, losses due to "spitting" and "creeping" are completely avoided. From advertisements in "Nature," it appears that Messrs. G. Beckers, Ltd., of London, have undertaken the sale of the full range of these crucible outfits.

A new reagent for analytical use is now obtainable under the name of "Hyperol." This consists of hydrogen peroxide of about 35 p.ct. strength, and is manufactured by the well-known firm of F. W. Berk & Co., Ltd. It is a product which should be of considerable service in the gas-works laboratory, particularly for sulphur determinations, as it forms such a convenient means of oxidizing these compounds to sulphate.

"Industrial and Engineering Chemistry" has published some interesting methods for determining the specific heats and latent heats of vaporization of oils. These methods, due to E. Zeitfuchs and E. Leslie, and others, respectively embody the use of internally electrically-heated Dewar flasks. After standardization with known pure liquids, amounts of distillates are compared with current consumption, and from these data the latent heats are calculated.

The apparent specific gravity of coke may be approximately determined by a method M. Dolch has outlined in "Zeitschrift für Angewandte Chemie." Instead of coating the piece of coke with wax or plasticene, and weighing with water in a vessel, the water is replaced by dry sand. With this practice there is no need to coat the outer surface of the coke (or firebrick—as the idea is obviously equally applicable to the examination of refractories), and an accuracy of within 2 p.ct. is claimed.

Of interest in the examination of sulphate plant effluents, a method for determining small traces of phenols in water should be noted. L. R. Vorce (in "Industrial and Engineering Chemistry") recommends the following operations: Make alkaline and filter, oxidize with hydrogen peroxide, and evaporate to a small bulk. The phenols may then be liberated by

distilling with citric acid, and are estimated colorimetrically in the distillates by the use of a solution containing tungstate, molybdate and phosphate of soda. This gives a blue coloration in the presence of phenols, and by comparison with a standard serves as a means of estimation.

Laboratory Apparatus.

A new type of valve for an automatic wash-bottle consists of a glass rod flattened at the top end and rounded at the lower end. This is supported in the mouth-piece tube of the wash-bottle, and when held down by the finger gives an open inlet passage. After blowing into the tube, the valve is allowed to rise, thus closing the air tube and ensuring a continuous flow of water until the air pressure drops or until the valve is pressed down again. The description, by H. Stephenson, appears with an illustration in "Chemistry and Industry."

A distinctly new type of apparatus for taking melting-points comes from New Zealand. By a device of Hosking and Short, which the "Journal of the Society of Chemical Industry" details, a current of air of any required uniform temperature is obtained by aspirating through a heated copper spiral tube. Various means are available for controlling the temperature of the hot air, which then passes round a thermometer to which is attached the sample under observation. The behaviour of the material is easily noted, and rapid tests are accomplished.

Tar Acids.

A report on the extraction of phenolic bodies from coke-oven and low-temperature oils by caustic soda appears in "Industrial and Engineering Chemistry," where Morgan and Meighan give some useful information regarding the solubility of phenols and cresols in caustic soda solution and also in phenolate and cresylate of soda. The treatment of fresh oils by once-used soda washes is of general application in the larger tar works practice, in order to separate lower phenolic homologues from the higher members of the series, and also to minimize the consumption of caustic, thus relieving pumping and causticizing operations as much as possible. In accordance with the methods outlined in the paper under review, extraction of definite phenols of any desired range may be carried out.

These writers also deal with methods for the determination of phenols in tar oils, and suggest that, after extraction with soda, the phenols should be liberated with dilute sulphuric acid in excess, and the mixed liquids poured into benzole. The benzole solution is made up to a definite volume, and the contraction after treatment with caustic soda is a measure of the volume of phenols. This method, I think, will be generally agreed, by workers in the tar industries, to be reliable.

Corrosion.

M. Leo ("Das Gas- und Wasserfach") has dealt with corrosion in plants where tar oils are used. The method of investigation involved tests on iron wire under working conditions; and an apparatus was designed for conducting tests in oil vapours. The conclusion drawn was that the presence of ammonium salts was the prime factor in troubles of this character. This appears to be a further confirmation of the theories put forward years ago by British workers, notable among whom ranks A. R. Warnes.

With regard to the corrosion of structural ironwork, usually so prevalent on the gas-works, C. Hartley gives, in "Chemistry and Industry," a paper which none should miss. Bituminous paints are favoured, for sound reasons, wherever possible; and the directions for making a typical mixture should be a valuable guide to those who are prepared to make-up paint for use on their plant.

Air-Drying of Solids.

In the "Journal of the American Ceramic Society" there has appeared a summary of the conditions which govern the rate of drying of clays. As most of the conditions referred to by D. C. Lindsay and W. H. Wadleigh govern also the air-drying of sulphate of ammonia, it may not be unprofitable briefly to deal with them. When crude sulphate is dumped into stores in wet condition, mere drainage will not reduce the moisture content below a figure which is largely dependent upon the size of the particles. The rate of drying of bulk material depends upon the amount of surface exposed to the air, and also, of course, upon the relative humidity of that atmosphere. As evaporation proceeds from the surface of the heap, liquid diffuses from the interior, owing to differences in surface tension and capillarity; and on reaching the surface, this liquid evaporates, and the moisture content of the whole heap slowly diminishes. The size of the particles, their arrangement and shape, their hygroscopicity—all these factors have an important bearing on the retention of water by solids. Much of the published information regarding the air-drying of soils and clays may be applied by the student of sulphate drainage and drying problems.

TWO-PART GAS RATE.

The two-part gas rate which was inaugurated some eighteen months ago in connection with domestic consumption at New London, Connecticut, is described in the "American Gas Association Monthly," by Mr. V. E. Bird, who explains that this particular system has been used with such eminently satisfactory results by the Connecticut Power Company that it was decided to apply it to the gas branch of the undertaking. Last August a survey of the domestic consumers showed that 58 p.ct. were on the new system, and 42 p.ct. on the old form of rate. This two-part rate has already had the effect, and will do so more and more, of increasing the Company's earnings from the small unprofitable customers, while at the same time encouraging the profitable customers to a freer use of gas.

The demand charge, it may be explained, is based on floor area; the two items of the account being:

Flat rate.—10c. per 100 sq. ft. of floor area per month.
Energy rate.—$1 per 1000 c.ft. of gas per month.
Minimum charge.—Flat rate.
Minimum area.—1000 sq. ft.

The floor area is determined by taking the outside dimensions of the building or apartment, multiplied by the number of floors, less an allowance for walls, &c., of 4 p.ct. per 1000 sq. ft. of over-all area up to 10,000 sq. ft., with a minimum allowance of 10 p.ct. Bay windows, unfinished attics, cellars, porches, and garages or other outlying buildings not fitted for living quarters are not included in computing area. With regard to the effect of the area rate on the customers, Mr. Bird states that with an average floor area per customer of 1220 sq. ft., all customers using less than 3000 c.ft. a month have had their bills increased; while those consuming in excess of 3000 c.ft. a month have benefited. In 1923, before the area rate became effective, 24·1 p.ct. of the Company's domestic customers were served at an actual loss; whereas for the year ended August, 1925, only 15·2 p.ct. were so served. This is a step in the right direction, which the Company consider it well worth while to have taken.

It will be recalled that at an Oldham District Conference of the British Commercial Gas Association in March, 1923, Mr. W. B. McLusky described a method which had been in operation for six years previously at Halifax. By this, he explained, reduced rates were offered for gas used in excess of what was called the "standard requirement"—a quantity which varied according to the floor area of the living or reception rooms. At the time Mr. McLusky read his paper, over 7000 consumers of gas for domestic purposes in Halifax—or fully 25 p.ct. of the whole—had adopted this scheme.

COKE OVEN GAS AT LOW TEMPERATURES.

A paper describing some experiments to discover how coke oven gas behaves when cooled by liquid air was read by Mr. W. H. Naylor at a meeting of the Northern Section of the Coke Oven Managers' Association, at Durham, on March 27. The author summarized his conclusions as follows:

(1) When coke oven gas at normal pressure is cooled to the temperature of liquid air (− 180° to − 190° C.), approximately 10 c.c. of liquid condenses from each cubic foot of gas—*i.e.*, 1 litre of condensate is obtained per 100 c.ft.
(2) The condensate has a specific gravity of 0·5, and on evaporation produces a gas having an average heating power of more than 1000 B.Th.U. per c.ft.
(3) The percentage of gas which liquefies is about 20 to 23 p.ct. by volume. This amount probably depends on the relative vapour pressures of the liquids, and cannot be increased by prolonging the cooling at this temperature.
(4) The gas which condenses out has the following average composition: C_2H_4, 16 p.ct.; CH_4, 79 p.ct.; other gases (CO, C_2H_2, N_2, &c.), 5 p.ct.
(5) In the higher boiling fractions, appreciable quantities of higher hydrocarbons (ethane, propane, and butane) were detected.
(6) Though gas containing a very high proportion (70 to 80 p.ct.) of ethylene can be obtained by cooling coke oven gas to low temperatures, and fractionating the products, this process would be uneconomical on a large scale, unless the methane fraction of the condensate could be rendered valuable. In this case the ethylene might be profitably converted into alcohol by absorption in a minimum quantity of concentrated sulphuric acid, and subsequent hydrolysis, or it might be found possible to convert such a concentrated gas into alcohol by a catalytic method.

The author suggested also that the methane fraction could be made, under suitable conditions, to produce methyl alcohol cheaply. It was known, he said, that at 800° C. methane reacted with steam almost completely, to produce carbon monoxide and hydrogen. Recently, a mixture of the two latter gases had been made to yield synthetic methyl alcohol on a large scale; and hence the possibility that the reaction $CH_4+H_2O \rightleftarrows CH_3OH+H_2$ might be effected in one or more stages. The close relation between methane and ethylene and such valuable substances as methyl and ethyl alcohol certainly invited further experiment upon these important constituents of gas. [From the "Iron and Coal Trades Review" for April 2.]

INTERNATIONAL COMMISSION ON ILLUMINATION.*

It will be remembered that the last session of the International Commission on Illumination was held in Geneva in July, 1924. Most of the papers presented on that occasion have been more or less abstracted and published in various technical papers, including the "Gas Journal,"† while a general account of the proceedings with digests of those contributions was formally presented to the Institution of Gas Engineers at the annual meeting in June last year, and included in the "Transactions" of that body.

The Commission's own and full report of the Geneva Conference, under the title of "Recueil des Travaux et Compte Rendu des Séances," has now been issued by the Central Bureau, having its headquarters at the National Physical Laboratory, Teddington. The volume runs to some 430 pages, and includes all the papers *in extenso*, abridged reports of the discussions on each, and many illustrations which were not available at Geneva. The book, together with the preceding and similar report of the 1921 session held in Paris, indicates generally the present position occupied by the science and technology of illumination, and supplies precise information as to the now internationally agreed fundamental units, symbols, and definitions employed in the work. They therefore constitute valuable volumes for reference by students of illumination, and may serve as useful incentives to further investigation of the fundamental and guiding principles on which good illumination should be based. Several of the papers in themselves show that in certain directions full knowledge has not yet been acquired, and that research is still needed.

It is to be borne in mind that the volumes have been issued for use in the various countries represented by the Commission. The official language of the Commission is French, and the expression of definite conclusions and records of proceedings are made in that medium, though English, French, and German are recognized at the Conferences for the purpose of papers and discussions thereon. These facts may be taken as the reason why the present volume, like its predecessor, is issued in French. In the new publication, however, papers which were presented in English are retained in that language. Each contribution also is prefaced by a concise summary of its nature in English, French, and German, and the digests suggest to those interested the desirability, or otherwise, of obtaining translations for any purpose they may have in view.

The volume gives a list of the nations represented on the Commission, and of the delegates from each. Among the latter are names of many investigators who have in their respective countries established reputations for good and sound work in the study of illumination and cognate branches of knowledge; and it is satisfactory, therefore, to note the general spirit of compromise and agreement evident in the discussions in which they took part.

The acceptance in 1909 of an "International Candle" paved the way for the settlement of the principal derived units and definitions at the 1921 Paris meeting, and the latter decisions as to symbols and definitions of minor quantities at the Geneva Conference. These have found expression in a species of "Esperanto" nomenclature enabling illumination matters to be internationally discussed, and results compared.

This is good work, and obviates a great deal of the trouble once caused by the conversion of photometric values, as well as terms, when international data were under consideration. The simple example of candle-power is sufficient to recall the confusion which was possible when types of lamps were compared, since the candle-power standards of different countries differed in intensity. The present agreement is not, of course, actually universal, since the Hefner candle standard still obtains in Germany and Austria; but the relationship of the latter to the international candle has been determined.

The Conference was attended by delegates from France, Great Britain, Italy, Switzerland, and the United States of America, with a single representative each from Poland and Japan.

The President (Dr. E. P. Hyde, of New York) in his opening remarks held out some hope of participation of other countries in the work of the Commission. Incidentally, it may be remarked that Germany, once a member, is again joining in this. Dr. Hyde pointed out that, while the Commission had for its object the study of questions of illumination and relative matters in cognate sciences, it would have failed in its duty and opportunity if the application of illumination to the needs of everyday life were not also the subject of consideration. The papers now published show that this phase of work has not been neglected, and indication is given in the discussions that it is likely to be developed still more in the future.

The papers contributed were 29 in number, and at least thirteen of them deal with illumination as applied in practice for household, workshop, school, street, and automobile purposes.

It is unnecessary here to do more than briefly refer to the various papers, since the contents of most of those of interest to the gas profession have already been brought to the notice of "Journal" readers. The contributions range over definite fields of work—such as questions of the establishment of a primary standard of light; proposals for international agreement as to photometric definitions, symbols, and the like; reports on progress made in heterochromatic photometry; practice in illuminating engineering; the lighting of schools and workshops; street lighting; and motor-car head lighting—with several papers on each. There are also single communications dealing with problems such as glare, the relative visibility function, and tungsten and tungsten lamps.

The report of the discussion on the possibility of a primary standard of light suggests that, while progress in investigation has been made, the difficulty of fixing a definite standard has yet to be overcome. This has been the subject of research since the Violle standard was proposed for international adoption in 1881. It has been discussed at successive conferences, but at the recent Geneva meeting the opinion was expressed that the desired standard was now practicable, and the matter was left to the chief national laboratories to formulate a precise specification for its production, and to fix the figure for its brightness in candles per sq. cm. The need for a fundamental standard is perhaps better understood when it is remembered that the international candle is one candle only by definition, and is not reproducible by specification.

Nevertheless, practitioners in everyday illumination will be well content with the accepted international candle and its maintenance by means of secondary standards at the hands of the three national laboratories of France, Great Britain, and the United States.

It will be seen that there was general agreement in the adoption of the symbols for photometric quantities proposed by the British National Committee, but that some considerable discussion took place on the various definitions before the latter were finally decided. The reports on these subjects as presented by the British, French, and American Committees are worth reading; but that by the Committee appointed by the Commission in 1921, and under the chairmanship of Prof. Blondel, is specially interesting, since it constitutes a useful résumé of previous decisions, and generally a statement of the views and suggestions from the constituent countries.

The nomenclature and definitions so far agreed are tabled in the volume, and are therefore available for use. It will not be surprising, however, if many of the terms are to some extent regarded as academic, and left to those with cosmopolitan interest in trade and technology. The everyday lighting engineer in Great Britain, and probably in the States, with other things to think of, will not easily drop his present conceptions of candle-power or of foot-candle units and similar derivatives.

The proposal to prepare an international vocabulary of terms and expressions used in illumination was fully discussed, and the remarks of the various speakers evidenced the desire for some such work. It was left to a Committee of members representing the languages concerned to consider the question. There already exist two vocabularies, prepared respectively in French and Italian.

The papers on heterochromatic photometry, the relative visibility function, and the work carried out by the National Physical Laboratory on colour temperature and luminous efficiency relation for tungsten, deal principally with the research effected during the preceding three years, and indicate what is termed the ever-increasing importance of the radiation of the black body as a basis for study. These subjects have apparently created the need of a new generic name. The adopted word "colorimetry," easily confused with "calorimetry," caused comment, but it was advanced in discussion that the expression had become established and was self-explanatory.

The volume contains an important paper on glare, contributed by Prof. Bordoni, of Rome. The phenomena of glare have been the topic of much discussion in the past, but are now being thoroughly investigated on scientific lines by workers in several countries. The particulars of the research by Mr. M. Luckiesh and his colleague (published last year in the Transactions of the American Illuminating Engineering Society), together with those of similar work carried out by Prof. Bordoni and now available, will provide those mathematically inclined with sufficient thought and exercise in applying their methods to everyday practice. Similar investigation is taking place in England; and the joint efforts may afford useful help in the consideration of the glare difficulty.

Prof. Bordoni's contribution was presented at the last moment, and could not be discussed. Originally written in Italian, it has been translated into French, and included in the present volume. Briefly stated, the author remarks that, as in the case of artificial lighting, especially electric lighting, the study of glare, in addition to that of the illumination obtained, was necessary, he undertook certain quantitative researches on the phenomena of the glare produced by the presence of light sources of small dimensions in the field of view.

* "Commission Internationale de l'Eclairage." Published by the Cambridge University Press. Price, 15s. net.

† Vol. CLXVII., pp. 642 and 697.
Vol. CLXIX., pp. 150, 219, 349, 538, and 606.

He gives reasons for supposing that it is possible to measure the importance of these phenomena by finding the diminution of the "coefficient of perceptibility"—or, in other words, the reciprocal of the brightness contrast perceptible to the eye. He states that glare does not depend entirely upon the brightness of the luminous source, but rather on the luminous flux which reaches the eye, and the position of the light source. A number of graphs are given in support of his conclusions.

Dealing with the avoidance of glare in street lighting, the paper concludes with the suggestion that a combination of properly designed refractors with semi-transparent globes for the purpose in view will probably provide the type of light for the future.

Though the total candle-power of a lamp, the angular distance of the light source, and the general brightness of the contrasted fields of view are obtaining greater prominence, it is difficult to dismiss the feeling that intrinsic brilliancy is still the important factor, and that the use of light sources in which this is relatively low lessens the necessity of shading devices, and of special mounting heights and spacings. In the elimination of glare, there may easily be a point where the efficiency of illumination is lost in the undue desire to achieve this object. The matter is opportune, as several of the National Illumination Committees, including the B.E.S.A. Street Lighting Committee, are at present considering glare effects in illumination.

The remainder of the papers in this volume deal with practical illumination. Some interesting information may be obtained from these on motor-car head lighting. The attempt internationally to standardize lighting of this character will necessarily be difficult in consequence of the requirements peculiar to each country. The comparison of methods, however, provides suggestive matter and may lead to improvement in the avoidance of its worst feature, which again is glare. Anyone in doubt as to the utility of international agreement and standardization in illumination should read Mr. H. Buckley's contribution on the subject. In this he points out, as an example, the advantages to industry, both in manufacture and in commerce, of standardized products described in a common terminology. The author proves the value of international agreement in the varied phases of illumination, in methods of rating lamps, and like matters.

The papers on practical illuminating engineering, furtherance of good lighting in central stations, and demonstration of good lighting practice were contributed by American delegates, and furnish information of the methods adopted in the U.S.A. They are all based on the experience of electric lighting companies; and so far as the conference was concerned, that of gas undertakings was not in evidence. Dr. Lieb, one of the authors, in discussion, stated that, though gas interests had not been represented, the American gas industry was equally alive, and took its share in the education of the public in matters of good illumination. The contributions deal generally with the methods used to that end, and with suggestions for further activities in the improvement of illumination schemes employed by consumers.

The authors are to be congratulated in that they have indirectly caused the Commission to give increased attention to the practical aspect of illumination. As one speaker (M. Mailloux) remarked, the importance of the relationship between theory and practice had been shown, and the programme of the Commission could not be fully completed unless the duty it owed to the public was recognized. The report on the lighting of factories and schools was accepted as a basis for regulations or recommendations on the illumination of such buildings.

The volume contains two papers on street lighting as practised in Paris, and one by Mr. H. T. Harrison on the principles of illumination as applied to thoroughfares, particularly in view of the situation brought about by motor traffic.

Whatever the opinions of those who attended the Conference, the feeling of the reader of this volume may possibly be that the contributions were too many, and that the discussion in some cases was inadequate. It should, however, be known that a few of the subjects—as, for example, photometric quantities, symbols, and definitions—had been previously considered by the various National Committees. The papers thereon were therefore more or less the summing-up and completion of work partly done. Happily none of the papers was read, it being assumed that the delegates had already acquainted themselves with the contents; and their presentation in groups and in the briefest résumés afforded the necessary time for discussion. It cannot be pretended that the debates covered all the points raised; some of the papers included in the volume being virtually undiscussed contributions. The opinions expressed in these should not therefore be taken as those of the Commission.

Taken as a whole, the "Recueil des Travaux et Compte Rendu des Séances" constitutes an accurate record of the proceedings at Geneva; and the compilation reflects credit on those who undertook it.

LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

Visit to the Works of the North Middlesex Gas Company.

On Saturday, April 10, the Association enjoyed a visit to the Mill Hill Works of the North Middlesex Gas Company, of which their President, Mr. W. L. Westbrook, is the Distribution Superintendent. The visit proved of exceptional interest to the many members who took part in it. Those on the manufacturing side of the industry found much to attract them in a Humphreys & Glasgow complete gasification plant, of which Mr. L. Trewby, the Engineer and Manager of the Company, expressed his satisfaction during the afternoon; while those concerned more particularly with distribution were able to make a thorough inspection of the stores that have recently been erected at Church End, Finchley.

Members met in the new offices at the Mill Hill Works, where a light lunch was provided. These offices, which, it is interesting to note, have been built of concrete slabs manufactured on the works from fine pan ash, are excellently designed and are particularly light. Mr. Trewby, Mr. Westbrook, and Mr. F. S. Pearce, the Works Manager, who is a Past-President of the Association, were there to welcome the visitors.

Inspection of the Works.

The first item of inspection was the retort house, which has a capacity of 1,500,000 c.ft. per day. This contains nine beds of ten through retorts, heated by regenerative furnaces. Charging is done by Guest Gibbons and Fiddes Aldridge machines, and the coke is removed by a telpher plant. The coal store runs parallel to the retort house. Coal is discharged from trucks on an elevated railway direct into the receiving hoppers of the coal breakers, and is afterwards elevated and distributed to continuous bunkers by push-plate conveyors. The capacity of the bunkers is 140 tons. Coal from stock is handled by a steam crane and grab, which discharges into a special dumping hopper feeding direct into the breaker. All the retort house machinery is electrically driven.

The condensers were next examined. These are of 2 million c.ft. capacity, and of the Clapham reversible water-tube type. They were completed last year.

Carburetted Water Gas Plant.

The plant is housed in a separate building adjacent to the coke ground, and consists of three sets, all by Humphreys & Glasgow. They are fitted with back-run gear. The total capacity is 3,500,000 c.ft. per day. One set is capable of making 1,500,000 c.ft., while each of the other two has a capacity of 1 million c.ft. One of the 1-million sets has been converted into a complete gasification plant. During the winter, and up to the present, it has been impossible to work this unit by itself, so that exact figures regarding working results are not available. It is known, however, that coal can be completely converted into gas, leaving nothing but clinker at the base of the generator. We were informed that, as soon as conditions of output permit, it is intended to carry out exhaustive tests, to arrive at some definite data.

Each set is fitted with a dust catcher; the blowers from this being used for plugging the furnace doors in the retort house. Air blast is provided by a Keith-Blackman high-pressure fan direct driven by a 60-H.P. Swedish De Laval steam turbine. This machine is being duplicated this year; the present standby being a Sturtevant blower, electrically driven.

Coke is drawn direct in bogies from the heap in the yard, and elevated to an operating floor by a hydraulic lift. It is interesting to note that all the sets are fitted with electrical pyrometers. As for the condensers, these are three in number, and are placed immediately outside the generator house. The oil storage consists of two steel tanks. One holds 105,000 gals., the other 212,000 gals. The oil is fed into these tanks by gravity from railway tanks on the siding.

Exhausters and Steam-Raising Plant.

Both coal gas and carburetted water gas exhausters are placed in a central engine room. The coal gas machines consist of two 60,000 c.ft. per hour, driven by horizontal steam engines. The carburetted water gas exhausters (one of 40,000 c.ft. per hour, the other 100,000 c.ft.) are driven in a similar manner. The inlets and outlets of both sets of exhausters are interconnected, so that in case of necessity gas from either section can be diverted.

For raising steam there are two Lancashire, two Cornish, and two Cochran vertical multitubular boilers. Another Cochran boiler is being installed this year Feed water is taken from the Metropolitan Water Board's mains, and treated in a "Becco-Legg" water softening plant of the dry powder type. This water is added to that recovered from the steam condens-

ing plant. The latter is treated before re-use in a Davis-Perrett electrolytic de-oiling plant, which removes traces of grease which is otherwise inseparable from the condensate. Once again indicating the progress of the Company, the erection of a new boiler house has been started.

Engine Room.

The visitors then passed on to inspect the machinery in the engine room, which adjoins the boiler house and the carburetted water gas plant. Nearly all the machinery in this room is run "condensing," the recovered water being re-used as before described. The electric generating plant consists of compound-wound inter-pole Siemen's dynamos (capacity 45 kw.) generating at 220 volts d.c., driven by Browett-Lindley compound high-speed totally-enclosed steam engines, in duplicate.

The steam condensing plant is of the evaporative type, and effects a large saving in steam consumption, though at present it is overloaded. This plant, we were informed, will be largely increased when the new boiler house has been completed.

Turbine-driven boosters are used for raising the pressure of the gas supplied to the outlying districts of East Finchley, Hendon, and Mill Hill, and are employed daily from 6 a.m. to 10.30 p.m. The pressure at the fan outlet is 18 in.

Tar Extractors, Washers and Scrubbers, Purifiers.

The coal gas, after leaving the exhausters, passes through a Livesey washer (capacity 2,000,000 c.ft. per day), two tower scrubbers (capacity 500,000 c.ft.)—these, it may be mentioned, were originally worked in series, but last year the connections were altered, and they are now worked in parallel, half the gas going through each—and a Holmes rotary washer-scrubber (capacity 2,000,000 c.ft.).

The carburetted water gas passes through two Pelouze & Audouin tar extractors, worked in parallel.

The coal gas and the carburetted water gas are purified separately. The plant for the former consists of a set of four 30 ft. by 40 ft. by 6 ft. dry-lute purifiers fitted with Milbourne patent valves and connections; the capacity being 2 million c.ft. a day. Gas enters these boxes during the winter at about 120° Fahr.; this temperature being maintained by a jet of steam entering the outlet main of the washer-scrubber. There are two sets of dry lute purifiers for the carburetted water gas, and further three are in course of construction. The grids used in the boxes are made on the works to a special design. The bottom grids effectively prevent any oxide falling into the bottom of the box. The others are of the open bar type. The gas in each case passes in a downward direction, and all the boxes are worked in forward rotation.

Station Meters and Storage.

For the coal gas there are two Parkinson meters of 30,000 and 60,000 c.ft. an hour capacity. The carburetted water gas is measured by a rotary meter having a capacity of 100,000 c.ft. an hour. At the outlet of the meters the two streams of gas enter a common main and pass through an Allen & Liversedge centrifugal washer, where the gas is oil-washed to remove any traces of naphthalene. It is found that this apparatus mixes the gases most effectively.

From the outlet of the centrifugal washer the gas passes through a 30-in. main to the holders, one of which holds 462,000 c.ft., and the other 768,000 c.ft. The governor room is embodied in the new block of offices to which reference has already been made.

Other Items of Interest.

We will now briefly pass over a few of the other items of interest in the tour of inspection. There is the sulphate of ammonia plant. This is an old-type Wilton, in which is produced Grade 1B salt. Then there are a breeze washing plant and a coke cutting machine. All the clinker and pan ash from the retort-house furnaces and the carburetted water gas plant is dealt with in a "Columbus" breeze washer. The recovered coke is burnt in the boiler furnaces, while the fine pan ash is used for concrete block making, and the clinker has a ready sale. The coke cutting machine, which is of the Cort type, is utilized for producing "smokeless nuts," for which, by the way, there is an ever-increasing demand.

Any description of the Mill Hill Works would be incomplete without mention of the workshops and excellently-equipped lavatories for the workmen. The former are at present being enlarged, while the latter are complete with shower baths. A canteen is also provided. A large garage houses the Company's transport, over which is an adequate works laboratory. The whole of the new buildings are erected of the concrete blocks made on the works.

Showrooms and District Stores.

The visitors were then conveyed to the Company's showrooms at Church End, Finchley. These, though small, occupy a commanding position; and everyone agreed that the best possible use is being made of the available space.

The new stores were put into use in June, 1925, and are the first unit of a scheme comprising showrooms, general offices, stores, and recreation rooms. In common with the other new buildings, they are constructed of the concrete blocks made by the Company's own men. The building is so arranged that the beds of the motor lorries are level with the floor of the stores at the loading doors. Ample window space has been provided. For artificial lighting, Sugg's "No. 7242" lamps have been fitted with distance control arrangements. The counter is 70 ft. long, and on the serving side is fitted with alternate rows of drawers and shelves, to facilitate quick service. The fixtures are arranged across the stores, with ample walking space between and on either side. There are a lighting section, geyser section, wrought-iron fittings section, &c. There is a plot of spare ground at the rear, for future extensions in the shape of workshops for meter repairs, cycle and truck accommodation, or other purposes. The stores should be adequate to meet the rapid growth of the Company's fitting business for many years to come.

The final item of interest in the visit was a demonstration of what Mr. Westbrook termed the wireless service pipe locator. Suppose that the position of a service is not known, all that it is necessary to do is to put the extreme ends of the service in circuit with a make-and-break coil. Then by this detector it is possible to trace accurately the path of the pipe, whether it is through the ground or in the walls of a house. Space does not allow a detailed description of this instrument here; but it is hoped to give a fuller account of it in a future issue of the "Journal."

The reason for the extensions of the Company's plant is, of course, the remarkable development of the sale of gas during the past few years. The whole of the Company's area of supply, which includes Church End, Finchley, East Finchley, part of North Finchley, part of Hendon, and Mill Hill, is being rapidly developed. In 1907 the figure for gas sold was 170 million c.ft. By 1921 this had risen to 459 millions. To-day the output is 573 millions.

The visitors then adjourned to the King Edward Hall, Finchley, where tea was provided by the Company.

Mr. Westbrook said they would have realized as a result of their visit that the North Middlesex Gas Company spared no effort in their endeavour to ensure the comfort and well-being of their employees. Opportunity had been afforded of seeing the men's recreation-rooms at Finchley. As for the youths, besides the training which the Company gave them, their expenses were paid for them to attend evening classes. He thought the visit had been of value not only to those who were engaged in the manufacture of gas, but also to those on the distribution side of the industry. He was sure the North Middlesex Company had done a great deal to encourage the London and Southern District Juniors.

Mr. Arthur Broadbent, the Senior Vice-President, proposed a vote of thanks to the Directors of the Middlesex Company, to Mr. Trewby and Mr. Pearce, and to those who had acted as guides; and this was seconded by Mr. Leonard Lacey, the Junior Vice-President, who remarked that seldom had he seen such excellent accommodation for the workmen as was provided by the Middlesex Company. He had been particularly impressed by the effective use made of the pan ash by converting it into concrete blocks, and by the complete gasification plant. Complete gasification was apt to be regarded with a certain amount of suspicion, but the plant at Mill Hill certainly appeared to be working most efficiently. A unit capable of producing 190 therms and 53,000 c.ft. per ton of coal gasified undoubtedly merited serious consideration.

Mr. Trewby said that his Chairman and Directors were very interested in the London and Southern District Junior Gas Association. No fewer than eighteen of the staff of the Middlesex Company were members of the Association. Those present were the first engineers to see the new complete gasification plant, which was working most satisfactorily. As for the stores, the arrangement of these was due to Mr. Westbrook and his staff.

Mr. Pearce, who also replied, mentioned that the last time the Association had visited Mill Hill was in 1921, during his year of office as President. There had been a great increase in the Company's sales of gas since that date. In 1925 the increase amounted to no less than 9½ p.ct., and at certain periods during last winter the increases were of the nature of 47 p.ct. They would therefore well understand the need for alterations and extensions. Speaking of the complete gasification plant, Mr. Pearce observed that this had dealt successfully with South Yorkshire coal and also with a mixture consisting of 50 p.ct. of South Yorkshire coal and 50 p.ct. of unscreened Durham. And the plant was in the true sense of the term a complete gasification unit. In other words, what was drawn from the base of the generator was clinker containing no fuel whatever.

Gas Aids Forge Work.—A portable forge has been built-up in the repair shop of the Chandler-Cleveland Motor Car Company in San Francisco. This, says Mr. C. W. Geiger, in the "American Gas Journal," is carried on four sets of casters, by means of which it can be taken to the job, instead of the job being brought to it, thus saving much time. At one end of the forge there is a preheating unit operated by gas and compressed air; rubber hose being provided for this. In connection with the forge is a water tank, for cooling metal; and this tank occupies the other end of the portable affair. Compressed air and gas connections are provided at different parts of the shop, for use with the forge in various locations.

NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

Discussion on the Two Papers read at the Spring Meeting in Motherwell—see "Journal for April 7, pp. 30-34.

THE QUESTION OF COMBINING GAS UNDERTAKINGS IN SCOTLAND.

By W. E. Whyte, District Clerk, Hamilton.

The President (Mr. John Wilson) said he thought the members would be ready to agree with him that it was a very happy thought that prompted him to encroach on the time of Mr. Whyte, and to ask him to contribute a paper. There was nothing panic-stricken about Mr. Whyte's work and words. The author at all events saw a future for the gas industry; and if that was the view of an outsider, it was entitled to weight.

Mr. H. H. Gracie (Edinburgh) remarked that the author was to be congratulated on the preparation of an able paper on a live subject, which he had brought forward at a most opportune time. His experiences and the interesting and useful data he had put before them would be of considerable value to all those interested in extending and developing the gas industry. The question of concentration of manufacture and distribution of gas from central or super-stations was of great importance at the present time, when a very extensive and far-reaching proposal for the development of the sister industry, electricity, was at present under review by the Government. If it was a desirable, essential, and feasible scheme to give the public a cheap supply of electricity, and if this was to be effected by putting-down a series of super-stations connected-up by a network or gridiron of cables over the country, it would be for the gas industry to consider whether a cheaper supply of gas could not be obtained by a somewhat similar course. It would appear to be of paramount importance that such a supply should be available, and, following the lines of uniformity in the electrical scheme, that the gas should approach uniformity in quality and pressure, with a view to standardization and mass production of gas appliances. This matter had been exercising the minds of engineers for some time; and he understood a scheme might be propounded for the apportionment of the country among a number of central or super-stations, where the gas could be manufactured and distributed under high pressure to various low-pressure re-distributing centres, picking-up on the way present outlying and rural areas now uncatered for. It seemed that, if an electric scheme such as indicated by the Government could be made a paying project, and result in large economies and cheaper supply to the consumer, then a carefully-planned, properly-organized and administered arrangement on somewhat similar lines applied by the gas industry should also result in good all round. It would lie with those in large stations to examine the question, and see how far they could contribute to such a desirable end. This would, in all likelihood, involve in some cases amalgamations, and in others joint working arrangements, by supplying in bulk to concerns already established and well equipped for distribution purposes. It would, of course, result in a concentration of gas manufacturing and bye-product producing plant at the central stations, and would, no doubt, involve over the next few years fairly extensive installations of new plant and corresponding expenditure. The problem of distribution in bulk over a wide area, and of joint working, would require considerable examination and investigation; and the matter of comparative costs of delivery at various centres, compared with the cost of production at these centres, would require to show a definite advantage to the consumer in favour of the former, to ensure increased business and distinct opportunity for expansion. The problem, he might add, was already under consideration by some of his Committee in Edinburgh; and a desire had been expressed that the subject should be examined in a practical manner. In making a general survey of the proposals put forward by Mr. Whyte, it was evident that at present there must be a large duplication and waste of energy which, if it could be pooled, re-distributed, and diverted into other channels, might emerge in more useful and profitable work by developing the distribution and sales side of the business. If this were backed-up by the large undertakings, with their experience and resources, an important step forward would doubtless be made. Unlike their competitor, however, which, according to proposals, might receive not only the blessings, but the financial support, of the Government, the gas industry would itself have to shoulder the burden of any new capital required, and provide its own technical and administrative boards. Under economic adminstration, however, benefits were likely to accrue to the public from both schemes, as the ultimate object in each instance was improved service, cheaper supply, and standardization of apparatus.

The Secretary (Mr. David Fulton) intimated that an important contribution to the discussion had been received from Mr. Napier.

Mr. J. W. Napier (Alloa) explained in this that he very much regretted his enforced absence from the meeting, particularly as such an able administrator in the affairs of public utility departments as Mr. Whyte was bringing before the members his valuable experience in the centralization of gas supply. The Lanark County Council were one of the most progressive of the local authorities in Scotland; and the Middle Ward Committee were fortunate in having Mr. Whyte as their adviser. That gentleman, at the outset of the county's scheme of gas supply, took a long view, having before him the ultimate result of a large supply area based on economic practice. It would be agreed that the Lanarkshire area provided an ideal scheme of fairly large towns in a concentrated gas supply district; and also this area was intensely industrial and populous. In addition, a supply of cheap coal was at hand; and the entire disposal of gas-works bye-products was assured within the same area. He suggested that Mr. Whyte would add to the value of his contribution if he could give data relating to the gas output at the time of amalgamation, compared with the present-day output. In this regard it would be of interest to learn the calorific value of gas previously supplied, and the heating value of gas furnished at the present time from the central manufacturing station at Uddingston. Then it would be valuable to hear what financial benefits in the matter of reduced price to consumers had resulted. The table supplied by Mr. Whyte showing the number and size of gas undertakings in Scotland focussed very well the possibilities of amalgamation of gas-works. It was striking to observe that, from a total number of 237 works, no fewer than 184 manufactured gas in quantities per annum of 50 million c.ft. and under. Only 20 works were shown as making between 50 and 100 million c.ft., and 33 works produced over 100 million c.ft. per annum. These data, however, were indefinite, and did not convey a correct understanding of the true position. Quite clearly the geographical situation of many gas-works was an important factor at the very outset. There must be—as, indeed, there were—a large number of towns situated at a considerable distance from larger towns, so as almost to make economy impossible by obtaining a bulk supply. The problem of amalgamation of gas undertakings, however, was not so much a practical question, having in view the success of long-distance transmission of gas, as it must be a financial matter with capital costs in mind. There were a number of comparatively small works selling gas at reasonable rates; and in many cases the capital outlay for transmission mains would result in no advantage to consumers. It would be noted that the absorption of small gas-works by larger undertakings had been a distinct feature within recent years.

PRESENT LEGISLATIVE POSITION.

Regarding the present legislative position, whereby it was possible to create large areas by the process of amalgamation, it must regretfully be stated that the existing powers were weak, and were of little or no practical value as regards municipalities in particular requiring to consider the amalgamation of gas supply undertakings. Mr. Whyte had stated the view that there would be difficulty in securing any scheme of amalgamation where companies only were concerned, and that there was no such difficulty as regards local authorities. While amalgamation of gas-works was contemplated under the Burghs Gas Supply (Scotland) Act, 1876, and Special Orders might be obtained under the Gas Regulation Act, 1920, for bringing about combination of undertakings, he desired to emphasize the absence of compulsory power of requiring local authorities to consider amalgamation before creating expenditure on their own local gas undertaking. The present position simply was that municipalities might continue to hold steadfast to their own particular area, unless mutual negotiations of a friendly character were entered into. That was to say, gas legislation in Scotland to-day was a dead letter as regards the compulsory amalgamation of gas-works, having in view the existing powers for borrowing possessed by town councils. Under the Burghs Gas Supply (Scotland) Act, a local authority in Scotland might borrow money at any time and to any amount on their own initiative, and for their own particular undertaking, without any regard being had to a bulk supply which it might be possible to obtain from another works. In respect of the existing power for borrowing possessed by town councils, it might be considered unfortunate that, before money was spent on their local needs, a special inquiry was not made by the Board of Trade or the Scottish Office. He could give a particular recent instance where a town council decided to spend £10,000 on vertical retorts—this with the acquiescence of the Scottish Office, and, strangely enough, with the help and enticement of an Unemployment Grant whereby payment of interest was made by the Government on a portion of the capital expenditure. This expenditure was actually incurred, notwithstanding that another municipality having a large gas-works and supplying gas at a low rate made a most attractive offer of a supply to the smaller municipality. This offer would have entailed a comparatively small capital expenditure, and, in addition, a much reduced price of gas. Such an aspect of local administration, having in view the use of gas as a matter of national importance, was to be deplored, and evidenced the need for amendment whereby parochial interests should not over-ride national interests. There was one other matter with which he desired to deal briefly. Mr. Whyte had spoken of the Electric Lighting (Scotland) Act, 1890, and the particular case of Alloa, where difficulties arising out of the working of the Electricity Department had been met by the gas consumers. The 1890 Act was surely out of date, having regard to a sense of equity. During each of the past two years, a sum of £5000 had been paid from the gas rates; while before the accumulated revenue losses of the Electricity Department could be liquidated, the sum to be paid by gas consumers over a number of years amounted to £70,000. It was surely evidence that this power of control given to a town council, whereby the interests of the gas consumers were subordinated to the interests of electricity, demanded immediate amendment. The case of Alloa was particularly strange, as a large capital expenditure was sanctioned by the Electricity Commissioners for a small local generating station, notwithstanding the fact that the town was encircled with supply mains of a large power company. The Electricity Commissioners appeared to have shown opposition to their own policy of large supply stations; and as a result the capital charge per unit of electricity sold to-day in Alloa was 3¼d. Finally, he desired to congratulate Mr. Whyte on the eminent success he had now obtained with his first conception of a combination of towns in one large gas supply area. He (Mr. Napier) was particularly interested in the Lanarkshire gas supply scheme and its successful operation. The late Mr. G. R. Hislop, of Paisley, and himself were the first advisors to the County Council of Lanark in their decision on a scheme.

Mr. James Bell (Dumbarton) referred to the insidiousness of the recent propaganda which had gone on by way of boosting the Electricity Bill. It seemed to him that, if they were only careful enough to adopt the right kind of propaganda, they would make even politicians vote against their principles. They had been hearing a great deal of late in regard to the unification of the smaller undertakings, and, indeed, even their own Technical Journals had been hammering

at that particular subject for a considerable time. There was no doubt that, if suitable legislation were introduced, it might be possible to evolve a scheme for the co-ordination of gas supplies which would benefit the public and the people they were out to serve. The fact that there were a great number of small undertakings throughout the country was not good for the gas industry. These smaller undertakings had not the resources behind them that the larger ones had. They did not take the trouble that the larger concerns did to proceed on proper and sound technical lines. Gas was run-down and criticized to-day because of the inefficient supplies given by the smaller concerns. The paper suggested a new line of thought and policy.

Mr. J. Campbell (Dunfermline) thought the issue raised by the author resolved itself into whether the combination advocated would give greater economy and greater efficiency. Personally, he thought it would. At the annual meeting of the Association last September he (Mr. Campbell) gave an illustration of what had been done in the way of combination in the Dunfermline area. In the case of Inverkeithing, the gas at one time was 8s. 4d. per 1000 c.ft.; while it was now 5s. 5d. In Kincardine there had been a similar reduction; and altogether the position in Fifeshire was comparable with that in Lanarkshire. It would be of value if the author would supplement his paper by supplying figures relative to increased consumption since the works were taken over, and also details of the reductions in price that had taken place. He thoroughly agreed with the views expressed by Mr. Whyte towards the close of his paper; and it seemed to him that they should not allow this subject to drop after the discussion had closed. They ought to consider ways and means of taking some further steps.

Mr. J. J. Scott (Cowdenbeath) observed that the paper expounded very clearly a train of thought which had exercised the minds of gas engineers for some years. Indeed, besides the Middle Ward of Lanarkshire scheme, several unifications had already been completed, while many more were under way.

Valuation Figures.

There was, however, a very important point to be considered, which usually presented itself as an aftermath of such schemes. He referred to the burdens of taxation and local assessments. Increased capital involved increased capital charges, which must be met out of the gross trading profit, whether it was a company or a local authority undertaking; and under the present method of ascertaining the rental valuation of gas undertakings—which method was known as the revenue principle—the greater the trading profit the greater the valuation for both local assessments and income-tax. The result was that capital expenditure of any kind forced a gas undertaking into an ever-increasing taxation which was seriously interfering with the industry's progress from the point of view of cheap gas and therefore increased sales. The effect of such an incidence on the selling price of gas could be fairly observed from an analysis of figures recently compiled in connection with the Rating (Scotland) Bill, where in the case of company works the valuation per million c.ft. made varied from £6 6s. in Montrose to £72 4s. in Ayr. The average over sixteen companies was £26 per million c.ft. In the case of local authority undertakings, the figure varied from £6 at Dumfries, £6 3s. at Helensburgh, and £7 2s. at Greenock, to £62 5s. at Port Glasgow and £70 at Cambuslang, with an average over 22 works of £24. Viewed from the point of profits earned, it seemed to him that, compared with any other form of ascertaining the annual value of a subject, the revenue principle was the most unfair. He was not aware of any other trade or industry which was valued so highly *pro rata* to its profits. From that point of view, it seemed to him great care must be exercised. Accordingly, he should like to ask Mr. Whyte whether, from his experience so far as it had gone, he had found the question of rates and taxes to be as he (Mr. Scott) had outlined.

Mr. J. D. Keillor (Greenock) said the best advice he could give his colleagues was to follow Mr. Whyte's lead, and benefit themselves as a result of the example he had set.

Mr. F. W. Carlow (Renton) was favourably disposed to the idea of combinations and amalgamations in the gas industry. Local difficulties he felt would soon be got over if they could have a uniform flat rate over the whole of an area.

Reply by the Author.

Mr. Whyte said his first word must be one of sincere thanks for the favourable reception given to his paper. Mr. Carlow had put in a plea for a uniform rate over the whole of the area. This unquestionably was the desire of the Middle Ward District Committee in Lanarkshire; and under the scheme that had been inaugurated they were tending speedily towards this goal He might explain, however, that when the scheme was inaugurated the Scottish Office would not at first hear of any proposal for a flat rate. The Scottish Office pointed out that the Committee were taking over the gas supply in districts where hitherto there had been rates ranging from 2s. 6d. to 7s. 6d. per 1000 c.ft.; and they held that it would be unfair to ask those who had enjoyed gas at 2s. 6d. to bear their share of the burden in reducing the price in the 7s. 6d. area. This view prevailed with the Scottish Office; but before long he hoped the Local Authority would be in a position to pool the resources throughout the area, so that in the end they would be able to introduce a uniform rate for gas. When he was able to give them the assurance that it would be a very modest price indeed, they would agree that the scheme looked like developing into a complete success in the near future. Since the scheme was inaugurated, the price in one district had gone down 1s. 3d. per 1000 c.ft., and in others 10d., 1s. 7½d., 2s. 11d., 2s. 9d., 1s. 3½d., and 2s. In only one instance had there been an increase; and this was due to circumstances which he had not now time to explain. This scheme of gas manufacture had proved its worth; and it was possible to contemplate still further reductions. He agreed that standardization, uniformity, and amalgamation would secure great things for the gas industry. They need not be afraid of electrical competition, if they boldly faced the situation as it presented itself to them that day. The position of the small gas undertaking had been referred to in the course of the discussion; and he wanted it to be clearly understood that he was casting no aspersion whatever on them. The smaller gas undertakings had truly been the pioneers of gas; but everyone now would concede that it would be foolish not to march with the times. He was not prepared to argue that in every instance the smaller undertaking must be linked-up with a larger concern. Geographical considerations must always be weighed-up; and it was conceivable that there were many instances in Scotland where the smaller concern would for all time be managed more economically than the larger one. On the other hand, they would find gas undertakings in particular areas where it seemed impossible to conjecture that they could not be combined with a great measure of success to all concerned. The scheme he had outlined ought to be applied wherever the conditions and circumstances were suitable and convenient. If only those responsible for the development of gas in Scotland would apply their minds to the question he had put before them, it would, he felt assured, result in immense benefit to all concerned. He appreciated to the fullest extent the point raised by Mr. Scott. Was it not monstrous to think that, if they scrapped a gas-works and left nothing but the holder, that concern, in the eyes of the assessor, would have as high a capital value as a complete and fully-going undertaking. This was really the position at the present time; and it was grossly inequitable. He had already fully dealt with this aspect of the question in a memorandum which he had sent to the Scottish Management Committee of the Gas Council. There was a need at the moment for a complete review of the system of valuing gas undertakings. Mr. Napier had raised a point as to the difficulty in effecting amalgamation because the consent of the parties interested required to be obtained. He (Mr. Whyte) was quite conscious of the difficulty; and this was why he had suggested that the Board of Trade or some such central authority should be empowered to bring about amalgamation if it could be shown to be beneficial to all concerned and in the public interest. If there had been such a central authority in the past vested with the powers he had described, millions of money could have been saved. He could tell them of scores of cases where there had been a foolish duplication of public services. If in his paper he had succeeded in indicating lines of thought likely to be beneficial to those engaged in the gas industry, and if he had shown a possible way by which the industry could not only maintain its present position but develop still further to its own benefit and the public advantage, he would be more than pleased.

POLICY IN DEVELOPING GAS SALES.

By David Fulton, of Helensburgh.

The President thought they would all agree that their Secretary had furnished them with a provocative paper.

Mr. H. H. Gracie (Edinburgh) considered that Mr. Fulton was to be congratulated on having doubled his sales in seven years; and it was interesting to learn the policy he had adopted in order to secure such an important advantage. Some years ago in Edinburgh they adopted a forward policy which included the granting of cooking appliances free. This had had a marked beneficial effect, because in the interval the sales of gas had increased by 30 to 40 p.ct. His own view was that they ought to look upon such expenditure as a contribution to advertising. If once a cooker was installed in a house, and the results were satisfactory, it would be spoken about to visitors, who possibly would not be satisfied until they had installed a cooker of the same type in their own homes. Again, it must be remembered that gas undertakings had to cater for a variety of different consumers; and they could feel sure that the policy of granting free appliances would appeal to a large section of the public who were not able to afford to spend money on high-class apparatus. In Edinburgh, besides free appliances, they let out apparatus on hire and on the hire-purchase system. In this way, they had a feeling that the requirements of the different sections of the community had been met.

Mr. James Richmond (Penicuik) agreed with all the strictures the author had passed on the policy of so-called free cookers. Nothing in this world could be got free. When cookers and such appliances were sent out on a free basis, it was inevitable that in the long run there must be a charge distributed over the general body of consumers to meet the cost. Mr. Fulton's policy developed a line that was worth noting—namely, that "every herring should hang by its own tail." This policy gripped a very honest trading principle which none of them should seek to evade.

Mr. J. W. Fairweather (Kilmarnock) considered that if one viewed critically and analytically the figures the author had supplied, one must give Mr. Fulton a great deal of credit for the way in which he had handled the situation in Helensburgh. The price of gas was certainly good; and it was conceivable that in a town and a district like Helensburgh there might be special circumstances. He agreed with all Mr. Fulton had said regarding the sale of gas. Within the past ten years there had been considerable improvements in the methods of gas cooking and heating. Nowadays there were innumerable opportunities for letting people see the latest fashion in gas fires; and naturally people became anxious to secure for themselves an installation of the most modern gas fires. Under a scheme supplying free cookers and appliances, the question of maintaining gas pipes became very costly and burdensome; and, generally speaking, just because of this, gas undertakings had to be very guarded in their policy.

Mr. James Dickson (Dundee) said it was possible that he would be regarded as appearing before them in the nature of a "devil's advocate;" but he felt it was incumbent upon him to defend a policy under which he was not unduly labouring at the present time.

Statistics from Dundee.

In Dundee, the policy of supplying free cookers was started in 1904; and it was interesting to note that a year later the quantity of gas delivered was 683,618,200 c.ft., and the capital per million was £570.

At that time the price of gas was 2s. 10d.; and the amount absorbed per 1000 c.ft. for annuities, interest, sinking fund, and contingent fund was 8·66d. In 1910 (by which time gas fires were also given free in the city), the quantity of gas delivered was 879,602,000 c.ft., the capital per million c.ft. delivered was £437, and the price of gas had dropped from 2s. 10d. to 2s. 3d. Not only so, but the charge per 1000 c.ft. for annuities, interest, sinking fund, and contingent fund had dropped to 7·16d. In the interval the number of appliances was a good argument for supplying cookers and other appliances free; from 2558 in 1910 to 16,131 at the present time. The city of Dundee was a good argument for supplying cookers and other appliances free; and at the present moment he was working from that standpoint. It seemed to him that Mr. Fulton had looked at this policy of developing gas sales entirely from the cooker and the gas fire points of view. He might well have dealt with such questions as service pipes and meters and the practicability of bringing an adequate pressure to the inlet of meters in blocks of tenements comprising anything from twenty to sixty houses. No doubt Mr. Fulton would be able to tell them the terms he allowed in such cases, for instance, as the renewal of service pipes. A city like Dundee was differently situated from Helensburgh. Maintaining a regular quality of gas and a regular pressure in industrial towns—especially between the hours of 7 and 8 p.m., from 11 a.m. to 1 p.m., and in the winter time from 5 to 7 p.m.—were points of primary and paramount importance. He was conscious of the fact that there were people living in tenement property in Dundee who were not getting anything like the services they should at the hours named. Efforts were, however, being made to effect an improvement in this direction. Mr. Fulton was considerably advantaged because of the class of population by which he was surrounded. If he were up against electrical competition in an industrial area, he might find the truth of the old adage that "circumstances alter cases." Even so, he was ready to concede that the author would be able to adapt himself to the changed circumstances. He entirely agreed with what Mr. Fulton had said as to the possibilities of a scheme for the revision of expenditure by introducing a hire-purchase scheme, whereby consumers might obtain cookers and appliances of a better and a superior grade. His own view was that the free cooker tended towards stereotyping a particular grade; and in Dundee they were considering the question of giving a better type of cooker a reasonable chance to justify itself in the estimation of the public. There were two sides to this question, and Mr. Fulton had argued his own case very ably. He (the speaker) was not responsible for the policy that had been followed in Dundee; but he was following it up, and was bound to say that to this day he was a continuing believer in it.

Mr. DAVID VASS (Perth) said that in Perth they had tried all kinds of schemes within the past twelve years. First of all they tried free cookers; and that was followed by a policy of rental. Later the rental was reduced, and now they were only charging a nominal figure for cookers. As a matter of fact, they were practically giving free cookers and fires. He agreed with the principle of free cookers, because it undoubtedly meant a larger consumption; and the people who were responsible for furnishing this increased consumption were surely entitled to some consideration. If they received this in the form of a free cooker, there was not a great deal to be said. It was just a form of differential rating; and he readily supported the idea. About 1914, he gave statistics of the system in Perth, which showed pretty conclusively that the installation of a gas fire in a living room was a paying concern. On the other hand, it was not a paying proposition when installed in an occasional room. On this account he was in sympathy with certain towns which put a limit on the number of fires provided free. In Perth many consumers were keen to have an up-to-date cooker, and were agreeable to pay for it, if it could be supplied on hire-purchase terms. A scheme had been introduced whereby payments for particular appliances of the better type could be spread over periods of from three to five years. There had sprung-up a great demand for these superior appliances; and he was hopeful that this demand would increase as time went on. In this connection he was referring particularly to gas cookers and cooking appliances, because he was bound to confess that the same demand had not arisen in connection with gas fires. The demand in Perth was still for the cheaper type of gas fire.

Mr. J. CAMPBELL (Dunfermline) found himself in agreement with what Mr. Fulton had said. In Dunfermline they had just adopted the policy of fixing gas fires at the lowest possible price. They had adopted this course with the double object of lessening the cost of the fire and making it an advantageous selling line. On the whole, he disagreed with the policy of giving cookers free.

Mr. JAMES BELL (Dumbarton) also favoured the policy outlined by the author. In Dumbarton, they had overhauled their old policy, and embarked on a new one of hire, hire-purchase, or outright sale. He was a believer in cheap gas; but this would not come about by supplying free the cheaper types of cookers. Results could only come from the higher-grade cookers; and these were given out in Dumbarton at the lowest possible price. The only appliance they supplied free was a hotplate; and in a working-class community this found even greater acceptance than a cooker. They had gone in for wholesale renewal of service pipes—enlarging them where necessary so as to provide an abundant volume of gas. If all undertakings would agree to tackle this work systematically, they would increase their consumption just as quickly as they could do by free appliances.

Mr. A. NISBET (Paisley) considered the members were much indebted to the author for his sound exposition of financial fairness and integrity in gas business.

Mr. J. D. KEILLOR (Greenock) thought the author ought to have said something in justification of payment for meters and other services.

PRACTICE IN AMERICA.

Across the "herring pond," they proceeded on the principle of charging something for everything; and he personally felt that the American policy was the right one. It was a policy that, sooner or later, would have to be followed in this country. They wanted to sell cheap gas; and in his opinion this was the crux of the whole question. He did not altogether like the idea of a service charge; but why should such a charge not be levied from every consumer? It was done in America in respect of services and meters; and if the same practice was followed in this country, they would be able to sell gas from 6d. to 9d. per 1000 c.ft. cheaper than they were doing. Why, he wondered, did they not do it here? Of course, he knew there were difficulties in that Acts of Parliaments and other things had to be got over; but he did not regard these difficulties as insuperable. Roughly speaking, a service charge would mean that every consumer would pay, perhaps, 15s. or 20s. a year. If they were able to knock 6d. or 9d. off the price of gas, it would really amount to a big thing, and, as he viewed the situation, it was a policy that would have to come into operation. It was an arrangement which worked very successfully in America and Canada, where they would never dream of supplying gas without having a service charge.

The PRESIDENT said they were indebted to Mr. Fulton for this paper, because he had stepped into the breach at a time when there appeared to be difficulty in getting a contribution from anyone else. The question of free cookers was the paramount issue that had been raised. When the policy of supplying free cookers was inaugurated, it did undoubtedly increase the sale of gas. Where an undertaking was over-capitalized, and there was a necessity for getting rid of more gas in order to reduce the capital charges, free cookers had been most advantageous. Up to now, it was a policy that had achieved its purpose. He quite agreed with some of the speakers that modern conditions probably demanded another policy; but he was satisfied, so far as they in Motherwell and Wishaw were concerned, that it had helped them in the past. The term "free cooker" was a misnomer; everyone knew that. The cost had to be recovered somewhere and somehow. In Motherwell and Wishaw they made a charge for fixing; and prior to installing a cooker a thorough examination of the premises was made. They had to be satisfied that proper use would be made of it; and a charge was made according to the position that the cooker took up. To his mind, this initial charge kept away the individual who wanted something for nothing.

THE AUTHOR.

Mr. FULTON, in the course of his reply to the points raised, said he was much in agreement with what Mr. Keillor had said in regard to their methods of charging for gas. In Helensburgh, the Clyde Valley Electrical Power Company had entered the district; and their terms were a service charge, *plus* a charge per unit. The rates were based on the size of house, and usually worked out at a rental of £1 per room, *plus* 1d. per unit. From the point of view of the Clyde Valley Company, this system had distinct advantages. It meant that the consumer had to "go the whole hog," because in the long run the rate was cheaper. Like Mr. Keillor, he believed they would in course of time develop along American lines, by having an initial charge for service, *plus* a low rate for what was actually consumed. He was glad to hear Mr. Dickson appearing as an advocate of free appliances. Indeed, the paper was expressly written with the object of drawing out the other side of the question. Certainly the conditions in Helensburgh and Dundee were widely different; but he did not, at the same time, altogether concede the theory that what was applicable to one town was not applicable to another. During the past seven years he had been constantly changing meters and putting in larger ones. This had been rendered necessary because of the increased consumption. So far as service pipes were concerned, they laid the service free to the line of the feu proper, and made a charge for the pipe inside the feu. This was an arrangement, however, which was subject to a certain amount of elasticity. They sought to meet consumers amicably in the matter of laying and relaying service pipes. When people understood they were receiving something in the nature of a concession, they were generally prepared to bear their fair share of the cost. There were many things nowadays in the world labelled "progress" which would not bear examination at all, since they were not progressive.

Cordial votes of thanks were passed to the authors for their papers.

Royal Sanitary Institute.—A sessional meeting of the Institute will be held at Hull on Friday and Saturday, April 23 and 24. On April 24, one of the papers to be read is entitled "The Present Position with Regard to Smoke Prevention."

Forced Lubrication of Valve Stems.—For lubricating valves placed in a horizontal position in gas mains, the Brooklyn Union Gas Company have adopted a service force pump which will apply 20 lbs. per sq. in. pressure to the lubricating oil supply. Sketching and describing the method in the "American Gas Association Monthly," Mr. J. H. Braine says a ½ or ¾ in. wrought-iron pipe is connected to the valve bonnet, with a stopcock close to the bonnet. Above this is a piece of 2-in. wrought-iron pipe, so connected that it acts as a receptacle for 2 quarts of lubricating oil. Next in line is a union, which is disconnected to fill the oil receptacle. To the union is attached a rubber hose from the force pump, which is equipped with a stopcock and a pressure gauge. With the stopcock near the bonnet closed, the oil receptacle is filled by disconnecting the union and using a funnel. Air is pumped up to 20 lbs. pressure with the pump stopcock closed; and then the stopcock near the valve bonnet is partly opened and the pump stopcock is fully opened. The pressure named is sufficient to force the oil into the valve in less than ten seconds; developing a splash through the small opening which distributes the oil.

MIDLAND JUNIOR GAS ASSOCIATION.

Visit to the Wellington Tube Works.

About forty members of the Association paid a most enjoyable and interesting visit to the Wellington Tube Works, Ltd., Great Bridge, on Wednesday, March 24. Conveyances were placed at the disposal of the party for the journey to and from the works, and upon arrival tea was provided.

The Chairman, in a few remarks before commencing the tour round the works, drew particular attention to the new furnace which has been erected for the buttweld mill; pointing out that this furnace had been built in 9 ft. of water. A drawing was shown of the concrete tank, made for this purpose. It had not been possible to use ferro-concrete, on account of the unequal expansion from the heat; and this design, with three layers of Val de Travers asphalt on the four sides and the bottom of the tank had proved most successful. There had been no trouble from water, and no cracking of the concrete. This point was of particular interest to gas engineers.

The tour was commenced with a visit to the small-tube department, where ¼ in. iron tubes were being made from the strip by the buttweld process, and the manufacture completed right up to the finished tube, screwed and socketed, painted, tested, and prepared ready for despatch. From here the party went to the lapweld department, where tubes are manufactured from 2 in. to 12 in. diameter. This process consists of two operations—bending and welding. The strip of the necessary thickness for the size of tube is brought to a red heat in a special skelping furnace, and is drawn out, and the edges overlapped; thus forming a comparatively large welding surface. This is then reheated in another furnace to a welding temperature, and is pushed into the welding rolls. The rolls are placed one above the other; a mandrel being used on the inside of the tube, so that the skelp is firmly pressed together between the mandrel and the rolls. Some 5 in. tubes were being rolled in long lengths and straightened, previous to being passed to the finishing department.

The next mill to be inspected was the new buttweld, which is said to be the latest and most up-to-date of its kind in the country. Here 1¼ in. iron tubes were being made. In this mill the strip of the proper width and gauge is charged into the furnace and heated uniformly to a welding temperature. The strips are then gripped with an attachment, and drawn from the furnace through bell-shaped dies. The inside of the dies is so shaped that the strip is gradually formed into the shape of the tube; the edges being forced together under pressure and welded. The tubes then pass through sizing rolls and a straightening machine, to give the exact diameter and finish. They are afterwards passed on to a cooling rack, where they slowly revolve, thus preventing unequal cooling, and ensuring that they are dead straight.

The gas producer plant, which is a completely mechanical installation, was inspected. The screwing and finishing shop in connection with the buttweld department was visited, and revealed how the tubes are conveyed by electric overhead runway, the ends cut off, and screwed at both ends. A special feature of this department is that there is a hydraulic test pump next to each screwing machine, so reducing the possibility of a tube passing through without being tested. Gas tubes are tested to 500 lbs., water tubes to 600 lbs., and steam tubes to 700 lbs. per sq. in.; and to show the quality of the tubes now being produced, several 1 in. buttwelded ones were taken from stock, put on the hydraulic pumps, and tested to over 1000 lbs. per sq. in., and while under pressure were hammered the whole length of the tube without showing any sign of failure. In the lapweld finishing shop similar arrangements were seen in operation. The bending department was also inspected, where tubes up to 12 in. diameter are bent to any special designs or requirements. These are used chiefly in connection with the steam mains department. A 6 in. bend was seen being shaped to template. The manufacture of black fittings was extremely interesting, and many visitors expressed their surprise at the skill and ingenuity displayed in this department. The progress of the fittings was followed through the black warehouse, where they are all inspected, through the machine shops, and into the finished warehouse for final inspection. Here there are over 1500 storage bins containing the finished fittings ready for despatch. The last item of particular interest to be seen in the works was a 250-ton hydraulic forging press, in which all kinds of tube manipulation are carried out. The ends of 4 in. tubes were being prepared for "Victaulic" joints.

The party then returned to the Offices; and the Chairman asked Mr. White, the Manager, to address the members.

TUBE MANUFACTURE.

By J. T. White, Works Manager, Wellington Tube Works.

If it is true of past days that "necessity was the mother of invention," it is doubly true in the case of the use and manufacture of tubes. Without attempting in any way to give a lecture on the modern manufacture of gas, with which all of you are conversant, I think it is as well for us briefly to run over some of the facts relating to the early days of gas manufacture, in order that you can see how, together with that development, the manufacture of tubes has more or less been kept side by side.

Gas, as we know, is "as old as the hills," for it is quite true by the immutable laws of Nature that, wherever animal or vegetable substances have become decomposed, a variety of gases have been produced, some of them inflammable and others not. Many opinions are hazarded to account for the almost perpetual fires which were kept burning on the ancient altars. In the time of the ancient Greeks, fire altars were exhibited in their temples, some of them about 13 in. in diameter. These altars were built over the apertures through which the natural gas issued, giving a continuous flame and thus forming the basis of the old fire worship. It seems to be also true that the fatal dancing "Will o' th' Wisp," which on the wild moors and bogs has lighted many a traveller to destruction, was none other than gases which had become ignited by some means.

The first pipes, as far as I know, were installed in London by Robert Crump, about 1618; and these appear to have been made of some composition. We also read in an article by R. C. Taylor, in "Breuster's Journal," that a natural gas was found in China, and was conveyed through bamboo tubes to a salt works, and used in the boiling and evaporating of salt.

The first record in our own country of natural gas being found is in the "Philosophical Transactions" of 1667; and there it is stated that a spring was discovered near Wigan, the surface of which could be inflamed. A little later on we read that during the sinking of a pit shaft at Whitehaven, at a depth of 42 fathoms, a terrific rush of air was found, which by some means became ignited, and produced a flame 3 ft. in diameter, and 6 ft. high. Several experiments were made on this gas by those responsible for the sinking of the pit, which had to be continued without the aid of artificial light, owing to the danger of escaping gases. When the seam was reached from which the gas escaped, it was securely walled off; and we read that the gas was conveyed to the surface in a 2 in. square tube. I think it is pretty safe to assume that this tube was made of wood. Some 30 years after this the attention of the scientific world was called to the nature and properties of inflammable air or gas, and those responsible for the working of the pit at Whitehaven sought permission to light the streets with the gas; but the magistrates refused to grant leave, as they considered the gas to be of a dangerous nature.

It is rather strange that about this time Dr. Clayton became interested in gas; and he mentioned that for the conveyance of gas for the experiments which he wished to make he strongly advised the use of a good thick bladder, similar to that of an ox, as if calves' bladders were used the gas would lose its inflammability in about 24 hours. And so the various experiments went on for about half-a-century, until in 1790 we find William Murdoch, then residing in Truro, Cornwall, and afterwards connected with Messrs. Boulton & Watt's establishment at Soho, turning his attention to the subject in a truly practical form. In 1798 part of the Soho Foundry was lighted with gas, which was exhibited to many of their friends. This seems to have been the first time gas was used for lighting a works or building.

It is quite obvious that, as the development of gas manufacture took place, so a suitable means had to be found for conveying the gas; and we read that the first mains systematically laid throughout a town or city were in London, and were laid by the New River Company, upwards of 250 years ago. These were simply trunks of elm trees, left on the exterior in their rude state; the interior being bored-out to the required size, which varied from 2 in. to 10 in. One end of the pipe was tapered like a spigot; the other end having a conical seat to receive the spigot, which was coated with white lead or cement, and joined together by being driven home with a mallet. This was probably the origin of the term "spigot," which is used to-day. There seems to be no doubt that in the time of the Romans wooden tubes were used to some extent in this country; and it is pretty safe to assume that this was the type of pipe used from the time of the Romans down to the beginning of the last century.

In a city in the western part of England an extensive trial was made of transmitting gas through a brick conduit, and earthenware pipes similar to drain pipes. Bottle-glass mains were tried, but never actually used in practice. Earthenware pipes were used extensively in France. These were joined together with Roman cement; but it was found that, through fracture, a great amount of gas was lost, and it is needless to say that this system resulted in complete failure.

There was one type of pipe used in France and on the Continent which was named after the inventor—the "Chameroy." This was constructed of leaded sheet iron about 16 gauge

thick. The sheets were turned over a mandrel, riveted together, and soldered. The pipes had then a coating of tar internally, and a layer of asphalt about ¼ in. to ⅜ in. thick, according to the size of the pipe, on the exterior. Although apparently so very fragile, these pipes were extraordinarily durable; many of them being in the ground for upwards of 20 years without showing the slightest symptoms of decay. The one great difficulty with this tube was the mechanical weakness; and trouble was often caused by the collapse of the tube. But when these tubes were installed and properly supported, we read that they proved the most durable kind that had been in use for the conveyance of gas. It was also claimed that they were particularly free from an action which is considered to exist to a certain extent with cast-iron pipes, called "Endosmose," which is derived from the Greek, signifying impulsion. This is considered very detrimental to the quality of the gas transmitted through a tube of a more porous nature.

To-day we are making a tube on a similar principle, with this improvement, that, whereas the "Chameroy" pipe was mechanically weak, our tube is mechanically strong; and there is not the slightest doubt that, where services are laid in made-up ground, the coated and wrapped tube which we manufacture to-day will give a very long life, treated with a special outside covering to protect it from all atmospheric and corrosive action. So developments have gone ahead, until now there are four common types in general use.

(1) Cast iron.
(2) Weldless steel.
(3) Lapwelded steel and iron.
(4) Buttwelded steel and iron.

As we do not manufacture the first, we need not consider cast-iron pipes. The second, weldless steel, has one great objection, which is the fact that these tubes, as far as we know, can only be made in steel; and as wrought iron has proved to be the only material that gas undertakings should use, we will confine ourselves to iron.

The Wellington Tube Works have specialized since 1872 in the manufacture of genuine Staffordshire puddled wrought iron tubes for gas companies; and we need not here go fully into the comparative values of iron and steel: This has been considered carefully by your Association, and is well known to you; but in passing I would refer to a strange coincidence—the fact that the analyses of wrought iron and mild steel are practically the same, with the exception that in wrought iron there is about 3 p.ct. of slag. The slag is interspersed with the molecules of iron, and so forms a protecting covering. This inherent quality gives to wrought iron the property of resisting corrosion, which does not apply to steel. It is estimated that the loss on account of corrosion throughout the world is over £700,000,000 annually, so the importance of using genuine iron only in the manufacture of tubes cannot be over-estimated. In this connection I would refer you to the report of the Wrought Iron Tubing Committee published last year, which should be carefully studied by all gas engineers.

It is a strange coincidence that in this very district, gas was first used for lighting a building, and here, also, the first tubes were made. These were manufactured in about 4 ft. lengths, welded up on an open fire. This was the old gunbarrel, which we read was used for the purpose of conveying gas.

The method of making tubes in longer lengths was invented by Cornelius Whitehouse, and patented by him in 1825. This has been considerably improved as the years have gone by, until, as you have seen this afternoon, tubes are now being produced by scientific methods that one may consider are well nigh perfect.

I do not think it is necessary for me to go into all the details of manufacture, as you have had an opportunity of seeing the actual work being done. Tubes up to 2 in. diameter are made by the buttwelded process, and from 2 in. upwards by the lapwelded process. You have seen both these methods yourselves, and will appreciate the differences. I would, however, make one remark with regard to the heating of the skelps from which the tubes are made, and that is, above everything else, one must obtain an absolutely even temperature at every point of the furnace. From what you have seen this afternoon in the furnace you inspected, this has been accomplished in an unquestionable manner.

Mr. J. H. GEE (President) expressed his appreciation of the excellent arrangements made by the firm for the comfort of the visitors.

Mr. C. E. TOOBY (Senior Vice-President) proposed a hearty vote of thanks to the firm, and said that the visit had been most instructive. This was seconded by Mr. H. HEMS (Junior Vice-President).

Mr. R. J. ROGERS (Birmingham Gas Department) said he would like to associate himself with the expression of thanks. He stressed the desirability of using wrought-iron pipes as against steel, and thought it would be to the advantage of all gas undertakings if their buyers took steps to ascertain that they were receiving best-quality tubes.

Dr. C. M. WALTER (Birmingham Gas Department) approved of the furnace which the Wellington Tube Works had installed. He referred to Mr. White's remarks on the question of the superiority of wrought iron over steel, and emphasized the importance of the corrosion-resisting properties of wrought iron. He pointed out that whereas steel was subject to localized corrosion, wrought iron, when corrosion did take place, corroded uniformly, and thus failure was postponed for a much longer period.

The CHAIRMAN, in reply, said it had been a great pleasure to have had this visit from the Association. Since 1872 the firm had been particularly interested in the gas industry, having specialized in the manufacture of tubes for the industry since that date.

NEW HYDRAULIC GOVERNOR.

At the East Greenwich Works of the South Metropolitan Gas Company is a Pelton turbine employed for driving a coal elevator. This turbine is mounted at the top of the boiler house. When it was originally installed, it had no governor, and some trouble was experienced on account of racing when the load on the conveyor fell off; and a man had to stand by the throttle to check the machine on such occasions. The turbine has, however, been fitted with governing gear, by Mr. Percy Pitman, of 25, Victoria Street, Westminster, and can now be left to take care of itself; the variation in speed between full load and no load being only 3 p.ct.

The governor controls the turbine by deflecting the jet from the wheel according to the load on the machine, which is, of course, a well-known principle; but the deflector is novel in form. It is arranged directly in front of the nozzle, and embraces the jet, instead of being above it only, as is generally the case. There is a slight constriction of the passage through it towards the outlet end. The result is that when the deflector is rotated by the governor, the jet is split by the two edges, and is diverted from the wheel in two separate streams. The proportions of the various parts are such that the reactions of the two streams on the deflector are equal; and, as they act on opposite ends of the diameter, they balance one another, and the deflector is in equilibrium in all positions. It is obvious that such an arrangement is a great advance on the type of deflector which is unbalanced and requires considerable force to withstand the reaction of the jet. The Pitman deflector can, in fact, be easily operated by hand, and can consequently be directly connected with a governor of the ordinary centrifugal type.

The governor is mounted on a pedestal between the Pelton wheel casing and the speed reduction gear-box. It is driven by silent skew gearing running in an oil bath, and is connected with the deflector spindle by means of linkage having ball joints. The wheel is capable of developing 3 B.H.P. when running at 1630 r.p.m., and supplied with water at a pressure of 700 lbs. per sq.in. The jet is approximately $\frac{3}{16}$ in. in diameter. The skew gearing of the governor reduces the speed to 815 r.p.m., and the main gear-box brings the speed of the driving shaft down to 50 r.p.m.

No attempt has been made to vary automatically the size of the jet to accommodate the load, after the deflector has taken care of the momentary fluctuation. The adjustment is instead made by hand by moving the needle backwards or forwards in the nozzle. It is interesting to note, however, that Mr. Pitman has devised a simple form of oil-operated servo-motor for this purpose, which is also controlled by the same governor. In such cases a dashpot is arranged between the governor and the needle operating gear to give a slight lag between the abrupt movement of the deflector and the gradual closing of the needle, in order to obviate any liability to shock in the water supply piping. With this arrangement the efficiency of the set is naturally improved, as only sufficient water is taken from the main to meet the demands of the load. In the case of a 35 H.P. unit recently set to work, Mr. Pitman has, for instance, guaranteed an efficiency of 79 p.ct. at full load, 80 p.ct. at three-quarter load, and 78 p.ct. at half load. In this machine the buckets are of manganese bronze, ground and highly polished inside, and are secured to a steel disc runner by fitted steel bolts. The bearings are bronze lined, and have ring oiling arrangements. The shaft is Siemens-Martin steel, while the needle tip, nozzle, and deflector are made of stainless steel. [Extracted from "The Engineer" for Feb. 12.]

Institution of Chemical Engineers.—The annual meeting of the Institution will be held at the Central Hall, Westminster, on Monday, July 19. The proceedings, which will be confined to the business of the Institution, with an address by the President, are expected to be brief, to enable the Institution to take part in the opening of the Exhibition of British Chemical Plant the same morning. Sir Frederic Nathan has accepted the Council's nomination for the office of President for the ensuing year.

REGISTER OF PATENTS.

Skip for Use with Crane or Transporter.
No. 245,545.

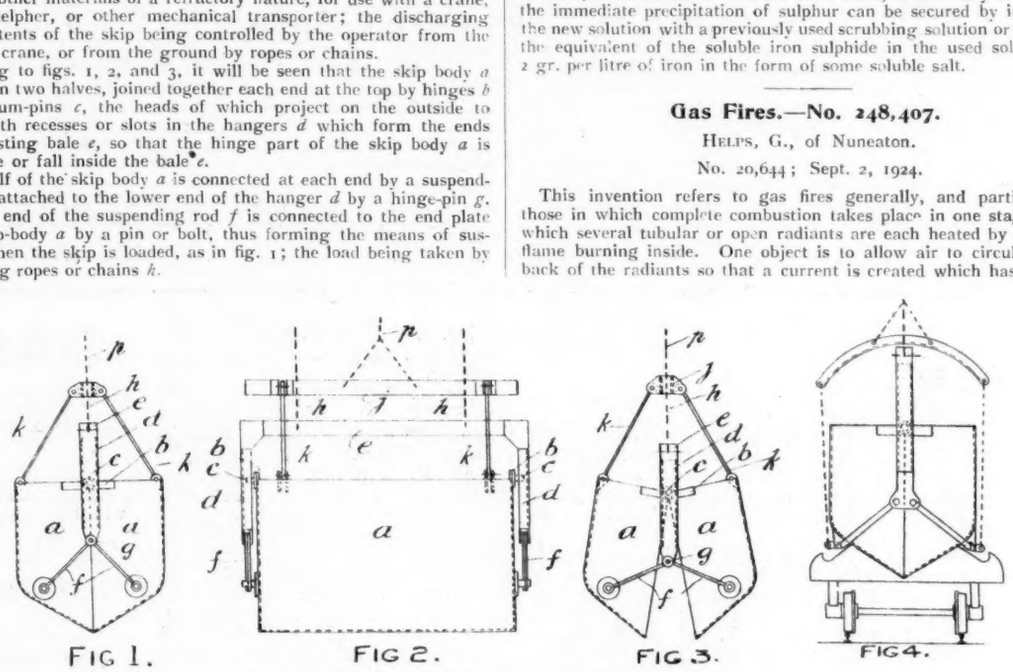
Williams, R. A., of Burnley.

No. 25,481; Oct. 27, 1924.

The object of this invention is to provide a skip for the conveyance of coal or other materials of a refractory nature, for use with a crane, monorail telpher, or other mechanical transporter; the discharging of the contents of the skip being controlled by the operator from the cab of the crane, or from the ground by ropes or chains.

Referring to figs. 1, 2, and 3, it will be seen that the skip body *a* is formed in two halves, joined together each end at the top by hinges *b* with fulcrum-pins *c*, the heads of which project on the outside to engage with recesses or slots in the hangers *d* which form the ends of the hoisting bale *e*, so that the hinge part of the skip body *a* is free to rise or fall inside the bale *e*.

Each half of the skip body *a* is connected at each end by a suspending rod *f* attached to the lower end of the hanger *d* by a hinge-pin *g*. The other end of the suspending rod *f* is connected to the end plate of the skip-body *a* by a pin or bolt, thus forming the means of suspension when the skip is loaded, as in fig. 1; the load being taken by the hoisting ropes or chains *k*.



WILLIAMS' TRANSPORTER SKIP.

The auxiliary or opening bale *j* is arranged over the main hoisting bale *e*, and is connected to the side of each half of the skip body *a* by connecting rods *k*.

The bale *j* is connected by a rope or chain *p* to an auxiliary drum on the crane, telpher, or transporter, and so geared that it may work in unison with the main hoisting drum; and it may be arrested at any point of lowering, thus taking the weight of the skip *a* by the connecting rods *k*, while the main hoisting bale falls to the position shown in fig. 3. The suspending rods *f* then extend outwards to the horizontal plane, parting the two halves of the skip at the bottom.

In a modification shown in fig. 4, the principle operation is identical; but in this case the hoisting and opening bales form one complete unit apart from the skip-body, so that one bale unit may be used for operating with any number of skips.

Gas Fires.—No. 248,141.

Headon, J. T., of Manchester.

No. 670; Jan. 9, 1925.

This invention for gas fires has for its object to provide a secondary heat-radiating chamber of improved construction. It provides a chamber between the gas fire and the final outlet to the flue, formed of good heat-conducting material, such as sheet iron, which is recessed on its front face to receive the gas fire, which lies within the recess. The chamber extends over the edges of the fire, and is shaped to form an ornamental surround to the same. Within the casing and extending across the same, and from the top to near the bottom, is a baffle plate. The front of the chamber is formed with an opening to receive the usual flue pipe or flange at the back of the fire, and a corresponding opening is formed in the rear wall of the chamber for connection with the chimney flue.

Purifying Gases.—No. 237,920.

Humphreys & Glasgow, Ltd., of Victoria Street, S.W.1.
Assignees of W. H. Fulweiler, of Wallingford (Penn.).

No. 19,468; July 31, 1925. Convention date (United States), Aug. 1, 1924.

This invention relates to the purification of illuminating and other gases, and has for its object to effect the removal of hydrogen sulphide by scrubbing with an alkaline and iron-containing purifying solution subsequently actified, when foul, by subjection to the ozidizing action of the air in a finely divided state, producing free sulphur and avoiding pollution of the atmosphere. The feature of the method, which is cyclic, is using a small quantity of soluble iron sulphide as catalyst.

The process consists in scrubbing gas with an alkaline solution containing a relatively small quantity of soluble iron salt in a form not precipitatable by hydrogen sulphide, thereby absorbing hydrogen sulphide from the gas with the formation of sodium sulphydrate and without forming insoluble iron sulphide, and fitting the solution for re-use by decomposing the sodium sulphydrate by passing sub-divided air through the solution thereby reforming the original salt and setting free sulphur as such and uncontaminated and avoiding the liberation of hydrogen sulphide.

At the outset, and when starting with a fresh scrubbing solution, the sulphur is not always precipitated in proper volume. After the solution has been in use for several days, the operation becomes more efficient, or normalized. On the other hand, if necessary or desirable, the immediate precipitation of sulphur can be secured by inoculating the new solution with a previously used scrubbing solution or by adding the equivalent of the soluble iron sulphide in the used solution—*i.e.*, 2 gr. per litre of iron in the form of some soluble salt.

Gas Fires.—No. 248,407.

Helps, G., of Nuneaton.

No. 20,644; Sept. 2, 1924.

This invention refers to gas fires generally, and particularly to those in which complete combustion takes place in one stage, and in which several tubular or open radiants are each heated by a separate flame burning inside. One object is to allow air to circulate at the back of the radiants so that a current is created which has the effect of drawing cold air round the radiants and sending out such air heated, in all directions. Such an arrangement, says the patentee, not only provides the apartment in which it is used with hot air, but it so dilutes the products of combustion escaping from the fire that within comparatively wide limits such products are quite harmless.

Another object of the invention is a portable gas fire in which, with this object, the radiants and burners carrying them project out laterally from the central body of the burner so that the central body does not hinder an up current of air having direct access to the space enclosed by the radiants.

Coin-Freed Mechanism.—No. 248,491.

Bingham, J. H., of Harrow, and Glover, G., & Co., Ltd., of Chelsea, S.W.3.

No. 29,724; Dec. 10, 1924.

This invention relates to coin-freed operating mechanism for gas meters, &c., wherein it is required to move a controlling or other member in accordance with the value of a coin, or of a number of coins. Its object is to provide improved mechanism of the kind which can be rendered effective by coins of different denominations.

The main feature is the provision of a single coin admission slot and single coin receiving pocket to receive coins of different denominations, which acting though a gauge plate in the pocket respectively determine the amount of movement transmitted to the associated mechanism, according to the size of the coin inserted. The gauge plate is movable by a spring to obstruct admission of coins into the coin pocket, and this gauge plate also serves as a coin ejector.

The design is fully described in connection with seven drawings, and there are fourteen claims.

Combustible Gases and Coke from Bituminous Fuel.
No. 248,518.

Power-Gas Corporation, Ltd., and Rambush, N. E., both of Stockton-on-Tees.

No. 31,219; Dec. 30, 1924.

(Patent of Addition to No. 235,958; March 26, 1924.)

This invention is a modification of that described in specification No. 235,958 [see "Journal," vol. 171, p. 287].

The modification is that a portion of the mixed gas leaving the top of the shaft generator during the cold blowing period, after being scrubbed, is returned to the bottom of the generator for replacing part or the whole of the steam used during the cold blowing period. This replacement may be effected by using the scrubbed gas together with steam, or by substituting for a part or the whole of the cold blowing or steaming period a so-called "gassing" period, or again by using the said gassing period in addition to the steaming period which may for this purpose be made shorter or less intense.

Inasmuch as the scrubbed gas has a higher calorific value than the water gas which would be produced if steam alone were used, it is

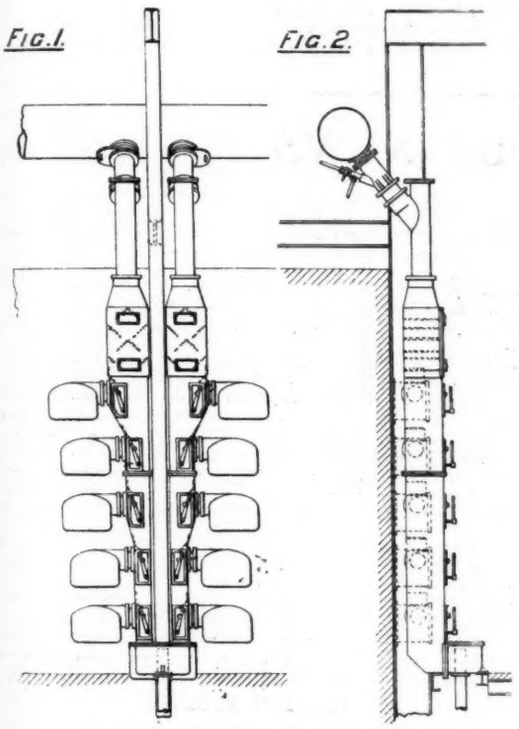
evident that the final gas obtained by distilling with a mixture of water gas and scrubbed gas, or scrubbed gas alone, which has been preheated in the fuel bed in the lower part of the generator, will give a final gas having an increased heating value.

Stand-Pipes.—No. 248,557.

ALDRIDGE, J. G. W., of Victoria Street, S.W.1., CARR, W. M., of Brooklands (Cheshire), and ASHLEY, A. E., of Broadstairs.

No. 5806; March 3, 1925.

With the object of obtaining equal pressure on all retorts, and with the object of obtaining an improved and more thorough washing and scrubbing action on the crude gas than with stand-pipes of uniform bore or cross-section, it is proposed according to this invention to make use of a stand-pipe whose cross-sectional area increases progressively in the direction of the flow of the gases, either upwards or downwards; the increase being effected either by a series of set-offs or by a uniform tapering enlargement of the pipe. Where the crude gas is to be passed upwardly through the stand-pipe and washed and scrubbed by a descending stream of liquor, the cross-sectional area of the stand-pipe increases towards the top; and that portion between the top retort and the foul main may be further enlarged and provided with a series of baffle plates arranged to project the liquor obliquely across the pipe in the form of films which the rising gases are obliged to penetrate. Owing to the increased cross-sectional area of the stand-pipe at this point, the velocity of the gas is considerably reduced, and more time is thus allowed for the liquor to take effect upon the gas.



Stand-Pipe—by Aldridge, Carr, and Ashley.

It will also be seen that as the cross-sectional area of the stand-pipe at any given point is made substantially proportional to the quantity of gas to be carried, the velocity of the gas will remain substantially constant throughout, so that ample time is allowed for the liquor to effect its washing, scrubbing, and cooling operations. Moreover, as the gas is kept in contact with the liquor for a longer period, less liquor is required to effect the cooling.

The scrubbing and washing effect can be increased by increasing the height of the enlarged upper part of the stand-pipe; and such provision will be of great advantage in works where the scrubbing and washing plant is limited in size or is of small capacity for the make of gas.

A further advantage of this improved arrangement is found in that the successive offsets of the stand-pipe render possible the use of short connections between the retort mouthpieces and the stand-pipe, and at the same time permit the retorts to be mounted in the setting in the most advantageous positions for heating.

The invention also provides (when conditions are favourable) for the sealing of the lower end of the stand-pipe by a water seal arranged at or above the level of the retort-house floor. Further, it provides means to prevent falling liquor from entering the retort mouthpieces through the branch connections; means to provide for the removal of particles of tarry matter adhering to the faces of the valves which control the branch connections, so as to enable the valves to be tightly closed; and finally an improved isolating disc or plate which can be moved quickly into position to isolate the stand-pipe from the foul main.

All these features are more fully described and claimed in the specification, which gives ten detail drawings, of which we reproduce fig. 1, a front elevation, and fig. 2, a side elevation, of a pair of the modified stand-pipes.

Governor.—No. 248,578.

KEITH & BLACKMAN CO., LTD., and KEITH, G., both of Farringdon Avenue, E.C.4.

No. 8228; March 27, 1925.

In the operation of a governor fitted with a relay valve of the diaphragm type as described in specification No. 202,919 [see "JOURNAL," Vol. 164, p. 202], it is found that the small pilot valve for working the relay valve, which pilot valve should be extremely sensitive, tends to become stiff, while the ports are liable to be choked with tar, &c., present as impurities in the gas.

To obviate these drawbacks, according to the present invention the small leakage hole affording communication between the inlet side of the governor and the back of the diaphragm is eliminated, and there is substituted therefor a connection in the cover plate of the diaphragm chamber to which is fed a small supply of clean gas or air. The latter may be taken from the air supply pipe of the installation described in specification No. 226,298 [see "JOURNAL," Vol. 169, p. 222].

The patentees claim: A gas governor of the diaphragm type fitted with a pilot valve penetrating the diaphragm, characterized by the feature that a connection is led to the cover of the diaphragm chamber to feed to the back of the diaphragm a small supply of clean gas or air whereby the pilot valve is washed.

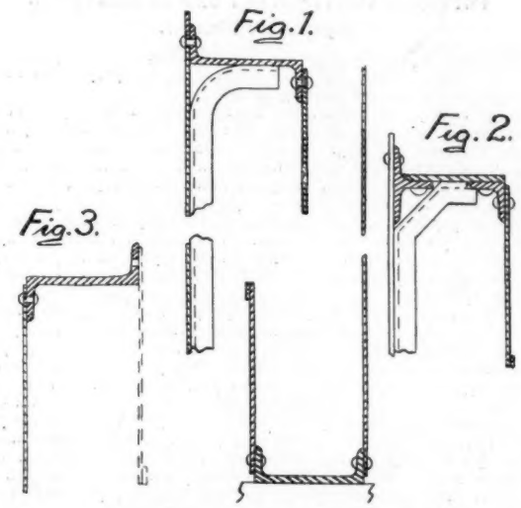
Dip Portions of Telescopic Gasholders. No. 248,689.

DEMPSTER, R. & J., LTD., and DEMPSTER, C., all of Manchester.

No. 1160; Jan. 15, 1926.

This invention has for object to enable the dip portions to be more completely constructed in sections ready for final attachment at their destination; the attachment, whether at the destination or temporarily at the works, being facilitated thereby.

It will be seen from the drawings reproduced that the feature of the invention is a **Z** section top member for the dip.



Gasholder Dips.—Messrs. R. & J. Dempster.

Fig. 1 shows parts of an inner and outer lift, the latter having the dip finally attached to the side sheeting, and the former assumed to be at its lowest position, with the cup portion resting upon a block. Figs. 2 and 3 are modifications.

Having regard to the fact that it is the practice to erect a holder from below upwards, say the patentees, it will be seen that with the use of the ordinary inverted channel section in place of the **Z** section illustrated, the height of side sheeting attained and length of skirting involved, when the dip portion of the lift is reached, render the final attachment of the dip difficult if the skirting is completely attached. But the use of an upward and external portion for the dip obviously renders final attachment of the dip quite convenient, even when complete attachment between the **Z** section and skirting is accomplished at the works.

Rest Blocks for Gasholders.—No. 248,691.

DEMPSTER, R. & J., LTD., and SCOTT, J. W., all of Manchester.

No. 1582; Jan. 20, 1926.

The patentees point out that the rest blocks of a holder are usually fixed in position, and, in the case of a spiral-guided holder of several lifts, there is some ingenuity required to arrange for suitable parts of each lift to be adjacent to a rest block at the time of contact; this being rendered more difficult by the fact that the spiral rails (of the type of holder referred to) are usually arranged alternately right and left hand.

This invention, however, is not confined to spiral-guided holders. Its object is to provide rest blocks in portable form, the same being attached to or projecting from the lower parts of the lifts, whereby the difficulty referred to does not exist, and the additional weight on

the holder due to the blocks is of advantage in increasing the pressure thrown by the holder.

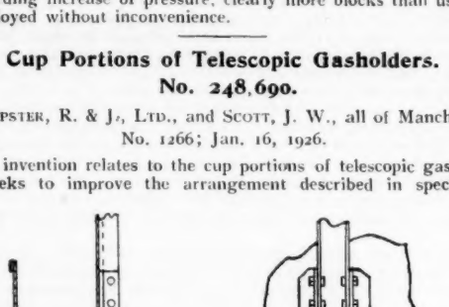
The rest blocks may be of cast or wrought iron; and two types are illustrated in the specification. In each case the blocks are riveted not only to the under side of the cup, but also to a vertical stay; and thus additional rigidity is secured.

Regarding increase of pressure, clearly more blocks than usual can be employed without inconvenience.

Cup Portions of Telescopic Gasholders.
No. 248,690.

Dempster, R. & J., Ltd., and Scott, J. W., all of Manchester.
No. 1266; Jan. 16, 1926.

This invention relates to the cup portions of telescopic gasholders, and seeks to improve the arrangement described in specification



Cups of Telescopic Holders.—Messrs. R. & J. Dempster.

No. 176,232 [see "Journal," Vol. 158, p. 104]. The latter involves the use of additional and strengthening plates forming part of, or in close proximity to, the bases or channels of the cups, giving increased area without increasing the widths of the cups themselves.

The plates so added extend in one continuous width from the cup concerned, and the present invention is to provide plates of the kind referred to, but capable of being detached or divided without interfering with the construction of the cup. In addition, the device may provide a more rigid connection between the added plates and the lift.

The sectional drawings which we reproduce indicate how the invention may be carried into effect.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for April 8.]

Nos. 8401-8928.

Chopin, M. J. E.—"Apparatus for analyzing gases." No. 8772.

Clark, R. G.—"Appliance for adjusting or clamping gas retort doors." No. 8707.

Clark, R. G.—"Hinges for gas retort doors." No. 8708.

Davidson, T. M.—"Distillation of solid carbonaceous substances." No. 8590.

Lambert, F. T.—"Cut-off devices for controlling gas burners." No. 8462.

Parkes, D. W.—"Removal of tar acids from ammonia liquor." No. 8503.

Parkes, D. W.—"Resolution of emulsions or suspensions containing tar or oil." No. 8604.

Pass, E.—See Clark, R. G. Nos. 8707, 8708.

Perret, I. G.—See Lambert, F. T. No. 8462.

Robinson, H. W.—See Parkes, D. W. Nos. 8503, 8604.

MISCELLANEOUS NEWS.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

Report of the Directors.

The following is the report of the Directors for the year ended Dec. 31, 1925, which will be submitted to the proprietors at the 178th Ordinary General Meeting on May 12.

As previously announced, the final instalment in respect of the Association's German claims has been received, and is incorporated in the accounts for 1925. The Directors recommend that the sum of £167,960 shown in the balance-sheet as received from the realization of the German assets, being an accretion to capital which has been realized and turned into money, be dealt with as profit, and applied in payment of a special dividend for the year 1925 at the rate of 8½ p.ct. per annum on the nominal amount of the issued capital stock of the Association, such dividend to be paid on May 20, upon the holdings of capital stock as registered in the books of the Association on April 20.

The profit for the year is £180,008 4s. 4d., which, together with the sum of £46,867 11s. 10d. brought forward from the previous year's account, makes a total of £226,875 16s. 2d. available for appropriation, out of which an interim dividend of 5 p.ct. (actual), less tax, amounting to £78,424 13s. 7d., was paid in November last. The Directors now recommend that, in addition to the above interim dividend, there be paid on May 20 a final ordinary dividend for the year ended Dec. 31, 1925, at the rate of 5 p.ct. (actual), less income-tax at 4s. 1½d. in the £ (being the average for the year), making, with the above interim dividend, a total ordinary dividend of 10 p.ct. for the year. The sum of £70,026 9s. will accordingly remain to be carried forward to the next account.

The total output of gas in the towns supplied by the Association in 1925 was 5675 million c.ft., showing an increase at the rate of 3·66 p.ct. on the preceding year. The number of consumers on Dec. 31 last was 267,640, and shows an increase at the rate of 3·97 p.ct. in the year. The quantity of coal carbonized during the year under review was 285,925 metric tons, at an average gross cost per ton delivered on the works of 22s. 4d., or 4s. 10d. per ton less than in the preceding year. The total quantity of electricity sold was 25,108,981 kw.-h., as compared with 21,574,759 kw.-h. in 1924—an increase of 3,594,222 kw.-h., or 16·7 p.ct. On Dec. 31 1485 miles of gas mains and 618 miles of electric cables were in use, as compared with 1425 and 547 miles of mains and cables, respectively, on Dec. 31, 1924.

At Antwerp, contracts giving the Association a gas monopoly until 1959 were concluded with the Communes of Bouwel (1018 inhabitants) and Vlimmeren (689 inhabitants). At Brussels, prolongations of contracts for the supply of gas and electricity were secured at Woluwe-St.-Lambert (12,969 inhabitants) until 1954, and at Cortenberg (2390 inhabitants) until 1965, and the gas contract with Braine l'Alleud (10,123 inhabitants) was prolonged until 1954. New contracts for the supply of gas and electricity were also concluded with the Communes of Cappelle-St.-Ulric (1044 inhabitants) and Bodeghem-St.-Martin (1207 inhabitants) until 1964, and with the Communes of Beckerzeel (366 inhabitants) until 1965. At Prague, the Association's exclusive right to supply gas in the Communes of Lieben (32,200 inhabitants) and Vysocan (9374 inhabitants) was prolonged until 1929.

At Antwerp, the installation of a waste-heat boiler on the Berchem Works was completed. On the Hoboken Works, the new water gas plant was put into action with satisfactory results, and four new purifiers were taken into use.

In March last, the manufacture of gas at the Dam Works, in the City of Antwerp, which had been in action since 1858, was discontinued; the output at the more modern works being correspondingly increased. The Dam Works are still employed as a gasholder station, and good use has been found for much of the plant at the Association's other works. At Brussels, the reconstruction of the vertical retort settings on the Forest Works was continued, and good progress was made with the extension of the railway sidings and coal handling plant on the land recently acquired. At the Droogenbosch Electricity Works the second 10,000 kw. turbo-alternator and three additional boilers were put into action. The new coal conveyor was also completed. At Flushing a new water gas plant was taken into use.

Advantage was taken of a favourable opportunity to acquire a freehold site in Devonshire Square, E.C.2, on which a new office, better adapted to the Association's requirements than the existing office at 6, London Wall, is being erected. A contract for the disposal, on satisfactory terms, of the London Wall premises has been concluded. Two small premises adjoining the Association's office in the Place de Meir, at Antwerp, were acquired. Extensive improvements to the Chaussée d'Ixelles offices at Brussels were effected, and a small house at the back of the Association's premises was purchased with a view to future enlargements.

The Directors who go out of office by rotation are Sir Charles James Jessel, Bart., Sir Henry Birchenough, Bart., K.C.M.G., and Mr. Harold Godfrey Palmer.

These gentlemen are eligible for re-election, and offer themselves accordingly. The Auditor who retires is Mr. Theodore Bromhead Bassett, who is eligible for re-election, and offers himself accordingly.

(Signed) C. J. Jessel, Chairman.

ELECTRIC COOKING

At the White Rock Pavilion, Hastings.

The Hastings Corporation are making headway with the equipment of the new White Rock Pavilion, which, it is hoped, will be one of the future attractions of the popular seaside resort. But when the expenditure on it is going to cease, is not exactly known. Time after time, additions here and there are made; and to these the Electricity Committee have contributed. Being a Corporation building, the old game is being played of omitting gas, in order that municipal electricity may have no rival for any purpose in which gas or electricity is employed. This sort of thing has been studied to such an extent at Hastings that it has now reached the status of a fine art.

The Expenditure and an Offer.

The Housing and Improvements Committee recently recommended the Corporation to sanction an expenditure of £100 for wiring the Pavilion to allow of cooking by electricity, and also for an expenditure of £811 6s. 6d. on the cooking equipment, which, it seems, is to be regarded as part of the expenditure for furnishing. It is stated that the outlay will include everything that could be wanted to provide for a full course dinner for at least 500 people. The Council agreed to the expenditure by 20 votes to 12; but it does not appear to have been known by the twenty members whether or not the Council are embarking on an uneconomical system of providing for the cooking. There were no competitive tenders from the Gas Company, apparently because they were not invited; nor did the Council have before them any comparative figures as to the costs of operation in connection with the two systems. Nothing of the kind. It was sufficient for a majority of the Council that the Electricity Committee put forward the scheme. A proposal by the Gas Company that they would pipe the Pavilion free while the opportunity allowed, so that any user of the building would subsequently be in a position to use gas if required, was turned down. In a letter in

which Mr. Charles F. Botley conveyed this offer of his Directors to the Corporation, he stated that he was not concerned at the moment whether it was the intention of the Corporation to require or use gas in the building for any purpose; all that he was interested in was the proposed omission of such provision from a public building of the town. Because of this, the Company were willing to make the provision of gas piping without expense to the Corporation, in order that it might be available. One would think that, in the interests of the town, the offer would have been willingly accepted by the Council; but a majority of the members appeared to be obsessed by the one idea of creating through the Pavilion a safe preserve for the electricity undertaking.

Cost of the Electric Cooking Equipment.

In the minutes of the Committee dealing with the foregoing matter, there appeared a complete list of prices for the electric cooking apparatus which it is proposed to instal, and which total to the figure already mentioned of £811 6s. 6d. It will be of interest to our readers to reproduce the quotation of the Jackson Electric Stove Company, Ltd., for the supply of the apparatus. It is as follows: Kitchen—No. 13 roaster, total net price, £92 2s.; six-plate boiling-table, £75; two-deck pastry oven, £52 16s.; extra for thermometers, £3; two-pan fish range, £39 12s.; No. 283 hot cupboard with doors both sides and two carving wells and Bain Marie in top, £56 13s. 6d.; extra for overhead gear, &c., £15 14s.; steaming oven of three compartments, £75; two 20-gall. boiling-pans, £58 10s.; one 30-gall. boiling-pan with container, £41 16s.; two No. 152 boilers, £15 16s. Service Lobby—No. 283 hot cupboard with doors one side and two carving wells and Bain Marie in top, £30 10s.; extra for overhead gear, &c., £15 14s.; No. 43 grill and toaster, £20 14s. 6d.; extra for hot cupboard above, £11; No. 241 water urn, 2 galls., £8 3s. 6d.; 8-gall. coffee urn, £18 12s. 6d.; 4-gall. milk urn, £15 18. 6d. Two Service Rooms—two No. 40 toasters, £30 5s.; four 10-gall. water-boilers, £31 12s.; two 2-gall. coffee urns, £25 6s.; two 2-gall. milk urns, £25 6s.; two No. 19 hobs only, £13 2s. Allowance for providing vitreous enamelled steel sheets in kitchen and service rooms, for smaller apparatus to stand upon, £20.—Total, £811 6s. 6d.

TORQUAY AND ST. MARYCHURCH GAS-WORKS.

The agreement between the Torquay and Paignton Gas Company and the Torquay Corporation Gas Committee for the acquisition by the Company of the Corporation Gas-Works at St. Marychurch, which was referred to in last week's "Journal," has been confirmed by the Torquay Town Council. The price to the paid is £31,450.

The Gas Committee reported that in February, 1925, the Torquay and Paignton Gas Company wrote to the Town Clerk suggesting that, in view of the proposal of the Corporation to spend £20,000 in improving the St. Marychurch Gas-Works, there should be a conference between the Company and the Corporation to see whether it would not be more economical for gas to be supplied to the entire area of the borough of Torquay and Paignton by the Company. A meeting was held, and as a result the Company obtained the advice of Mr. Arthur Valon. A copy of his report was supplied to the Corporation. In May an offer to purchase the undertaking was received from the Company; but the Committee felt that they could not recommend the Council to accept it. The Committee subsequently received reports from the Town Clerk, the Borough Treasurer, and the Gas Engineer, and upon those reports decided to seek the advice of Mr. W. Doig Gibb. He made a report to the Committee, the substance of which was that, having regard to the situation of the St. Marychurch Gas-Works and other factors, the Corporation could never expect to supply gas to consumers in the old parish of St. Marychurch as cheaply as the Company could supply it. Negotiations continued; and eventually the Committee recommended the Corporation to sell the undertaking for the price named.

ELECTRIC LIGHTING SHARE TRANSACTIONS.

Serious Allegations.

On March 30, in the King's Bench Division of the High Court of Justice, Mr. Justice Rowlatt heard a motion by Mrs. Emma Friend, of Brixham, for judgment in default of due delivery of a defence in her action against the Chagford and Devon Electric Light Company, Ltd., and the Light and Power Finance Corporation, Ltd.

Mr. L. W. J. Costello (for the plaintiff) said the claim alleged fraudulent misrepresentation in respect of the purchase of certain preference shares. The defence was ordered to be delivered by Feb. 19, but was not tendered until March 18—two days after defendants had been served with a notice of the motion.

Mr. E. B. Calvert (for the defendants) said the defence was a total and absolute denial of the plaintiff's allegations. It was quite as likely to prove true as the assertions of the plaintiff.

His Lordship said he would make no order on the motion. The costs would be plaintiff's, and were to be taxed and paid within three weeks. If they were not paid, the defence would be struck out.

Gas Demand in Dublin.—In connection with the increased demand for gas for lighting, heating, and cooking in the Dublin area, as mentioned by Mr. F. J. Dickens, Chairman of the Alliance and Dublin Consumers' Gas Company, at the recent half-yearly meeting, it should be stated that hundreds of applications have been received lately, many of them from electricity consumers, who find gas cheaper and more convenient. Provision has been made for gas supplies to housing sites at Templeogue Road, Rathmines Park, Rostrevor Road, St. Mary's Terrace, Rathfarnham Road, Harold's Cross, Dundrum, Cherryfield Avenue, Hollyfield Buildings, Mountpleasant Site, Keogh Barracks, St. Joseph's Place, Fairbrothers' Fields, Glasnevin, Cabra, Marino, Vernon Gardens, and John Street.

NORTH-EAST COAST COAL TRADE.

[From our Own Correspondent.

There is little real activity in the market, though a firm tone is maintained, and nominal prices are quoted high. In spite of the very delicate situation here, Continental consumers are showing no anxiety, and are not pressing for supplies. This is undoubtedly because they can now obtain coal elsewhere at favourable prices and with greater certainty of delivery. As evidence of this, Durham tenders for 7000 tons of gas coal May delivery have been passed over, for the first time, it is said, by the Bordeaux Gas-Works in favour of Silesian coal. If a stop does come next month, there is no knowing what markets may be permanently lost to us.

Trade beyond the end of this month is at a standstill owing to the uncertainty which exists as to what the position will be. Sellers cannot offer at current prices if the subvention is to be withdrawn, and would-be buyers are unwilling to pay more.

For prompt positions, best qualities are mostly sold-out, and quotations rather nominal; but there are still second qualities to be had in most sections.

Wear Special gas makes quote 20s. to 21s., and best qualities 19s. to 20s. Seconds are about 15s. 6d. Coking unscreened is 15s. 3d. to 15s. 9d. f.o.b.

YORKSHIRE AND LANCASHIRE COAL TRADE.

From our Local Correspondent.

The collieries in Yorkshire and Lancashire have gradually resumed work after the Easter holidays, with a state of affairs prevailing similar to that which operated prior to Easter.

The negotiations now being carried on leave an undecided opinion among those chiefly concerned, although it appears there will be some difficulty in regard to the future working of the thinner seam pits. Traders throughout the country are naturally undecided as to their future policy in respect of coal purchases, and unless there is a settlement which will cover a period of years there will be no confidence in the country.

The export trade appears to go from bad to worse, and there are weekly instances of the increase of foreign competition.

The following are the Humber bunker and export prices (f.o.b. usual shipping ports): South Yorkshire—Hards, Association, 20s. 9d. to 21s.; screened gas, 19s. 6d.; washed trebles, 20s.; washed doubles, 19s.; washed singles, 17s.; washed smalls, 12s. 3d.; rough slack, 8s. 9d. to 9s. 3d.; smithy peas, 19s. 6d. to 21s. 7d. West Yorkshire—Hartleys (f.o.b. Goole), 17s. 6d. to 18s. 6d.; washed trebles, 18s. 6d.; washed doubles, 17s. 6d. to 18s. 6d.; washed singles, 16s. 3d. to 16s. 9d.; washed smalls, 12s. to 12s. 3d.; unwashed trebles, 18s.; unwashed doubles, 14s. to 14s. 6d.; rough slack, 9s.; coking smalls, 9s. to 9s. 6d. Derbyshire and Nottinghamshire—Top hards, 20s. 6d. to 22s. 6d.; washed trebles, 19s.; washed doubles, 18s.; washed singles, 17s.; washed smalls, 11s. 6d.; rough slack, 9s. to 9s. 6d. Yorkshire, Derbyshire, and Nottinghamshire—Screened steam, 17s. 6d. to 19s.; furnace coke, 16s. to 17s.—all per ton.

COAL TRADE IN THE MIDLANDS.

[From Our Local Correspondent.

Most of the collieries in this area got to work again in the middle of Easter week, and a regular output is being made. Rather more coal is being called for by householders than is usual at this period of the year; but the demand is not sufficient to arrest a seasonal decline in values. Revisions depend very much on local circumstances. They do not as a rule represent a fall of more than sixpence or a shilling a ton, and for quite a number of descriptions prices are stationary. While there is little accumulation in the market for industrial fuel, sales appear to be in excess of current consumption. The heavy trades are cautious buyers; but in the lighter metal-working branches, as well as in other industries, a forethoughtful policy is being adopted.

There is not much change in the market position. The railway companies were able to secure contracts this year on terms so much more favourable than those which previously applied, that they continue to stock freely. Other services which depend upon coal are maintaining their reserves at a high level.

Though there has been no further attempt to negotiate between the cokeries and the organized blast-furnacemen of the Midlands, contracts have been entered into for the second, and in some cases the third, quarter on reduced terms; medium grade cokes, such as are used for iron smelting in the district, being obtainable at about 14s. or rather more at ovens.

Gasworkers' Strike at Glasgow.

Deadlock continues in connection with the strike of 600 employees in the distributing section of the Glasgow Corporation Gas Department as a protest against the dismissal of a number of their fellow workmen for disciplinary reasons (see "Journal" for March 31, p. 826). According to the "Glasgow Herald" for April 8, since the Corporation decided to approve of the attitude taken up by the Gas Committee in relation to the strike, representatives of the workmen have referred the conditions regarding their return to work to the Chairman and Secretary of the Glasgow Trades and Labour Council, and correspondence has taken place between Mr. William Shaw, Secretary of that body, and Sir John Lindsay, the Town Clerk. The men's conditions, as stated in Mr. Shaw's letter, include a request that a Committee of inquiry shall be set up, and that it shall consider reinstatement of the men who were dismissed within seven days. The Town Clerk's reply reaffirms the Corporation's determination that the men shall return to work before such a Committee can be appointed.

TRADE NOTES.

Gas Cookers.

Messrs. Stoves, Ltd., of Rainhill, have published a new cooker list dealing particularly with their "Bakerloo," "Household," and "Reliable" models.

General Gas Appliances, Ltd.

This Manchester firm have published a new catalogue of the cookers—such as the "Triumph," the "Zenith Service," the "General Purposes," the "Britannia," the "Bantam," &c.—they manufacture.

Potentiometer Controllers.

The Integra Company, Ltd., of 183, Broad Street, Birmingham, have issued a new publication describing Leeds & Northrup potentiometer controllers for maintaining automatically a constant temperature in any kind of furnace heated by gas, oil, or electricity.

Carburetted Water Gas Plants.

Orders for carburetted water gas plants have recently been placed with Messrs. Davison & Partner, Ltd., of Westminster, by the Accrington District Gas and Water Board, the Burton-on-Trent Corporation Gas Department, the Clacton Urban District Council Gas and Water Department, and the Watford Gas and Coke Company.

"Midflex" Tubing.

The Midland Flexible Metallic Tubing Company, Ltd., of Vulcan Works, Long Eaton, have published an illustrated booklet dealing with their product. Flexible metallic tubing was first placed on the market about thirty years ago, and the progress in manufacture and design has made such rapid strides that, with the experience gained, the firm are now able to produce a first-class tube of great strength and superior finish at a low price. The firm manufacture flexible tubing in sizes from $\frac{3}{16}$ in. to 9 in. internal diameter.

CONTRACTS OPEN.

Gasholder Painting.

The Neath Corporation Gas Department are inviting tenders for the painting of two gasholders. [See advert. on p. 117.]

Coal Handling Plant.

The Skipton Urban District Council are inviting tenders for the supply of a coal breaker and elevator, &c. [See advert. on p. 117.]

Slot Meter Installations.

Tenders are invited by the Sidmouth Urban District Council for fitting up 100 houses with slot meter installations. [See advert. on p. 117.]

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

London, *April* 12.

The market for tar products continues steady.

Pitch is rather quiet; but values remain unchanged at about 87s. 6d. per ton for this season's shipment, and 80s. per ton for Oct.-Dec. shipment.

Tar for road work is in strong demand, and very large quantities are being delivered.

Creosote is firm at 7⅛d. per gallon net and naked at makers' works.

Pure benzole and pure toluole are steady at about 2s. 2d. to 2s. 3d. per gallon.

Solvent naphtha, 95/160, is rather firmer at about 1s. 10½d. to 1s. 11d. per gallon.

Pyridine bases is quiet at 19s. to 20s. per gallon.

Tar Products in the Provinces.

April 12.

The markets for tar products continue quiet.

So far as pitch is concerned, the market is easier. There is little or no demand for prompt delivery, and sales are reported to have taken place at 83s. 6d.; while for next season offers have been made at 80s. without bringing any response from buyers.

Creosote continues steady at existing prices.

Water white products are firm.

Benzole is decidedly scarce, while solvent naphtha is fetching good prices. Heavy naphtha still remains difficult to sell.

Carbolic and cresylic are quiet, and there is little or no demand.

Naphthalene and anthracene continue entirely neglected.

The average values for gas-works products during the week were: Gas-works tar, 54s. 6d. to 59s. 6d. Pitch, East Coast, 81s. 6d. to 83s. 6d. f.o.b. West Coast—Manchester, 74s. to 76s.; Liverpool, 75s. to 77s.; Clyde, 80s. to 82s. Benzole, 90 p.ct. North, 1s. 8½d. to 1s. 9½d.; crude, 65 p.ct. at 120° C., 1s. 1d. to 1s. 2d., naked at makers' works; 50-90 p.ct., naked, North, 1s. 8½d. to 1s. 9½d. Toluole, naked, North, 1s. 8d. to 1s. 9d. nominal. Coal-tar crude naphtha, in bulk, North, 8d. to 8½d. Solvent naphtha, naked, North, 1s. 5d. to 1s. 6d. Heavy naphtha, North, 11½d. to 1s. 0½d. Creosote, in bulk, North, liquid, 6½d. to 6⅝d.; salty, 6d. to 6⅛d.; Scotland, 5¾d. to 6d. Heavy oils, in bulk, North, 6¾d. to 7d. Carbolic acid, 1s. 4d. to 1s. 5d. prompt. Napthalene, £11 to £14; salts, £4 to £5, bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

Additional Plant at Accrington.—The Accrington District Gas Board have approved a scheme of extensions. The Manager, Mr. A. J. Harrison, reports that the demand for gas necessitates additional producing plant, and part of the trunk main system needs to be relaid and enlarged. A carburetted water gas plant, capable of producing 800,000 c.ft. a day, is to be put down, which, with the existing vertical plant and the horizontal retorts, will give a daily production of not less than 3 million c.ft. The costs are: C.W.G. plant and accessories, £7000; gasholder and plant, £5500; mains, &c., £17,100—a total of £29,600.

More Gas More Sunshine.

The last ten years have been marked by a notable reduction in the annual sootfall and a commensurate increase in the average daily amount of sunshine in the Metropolitan area. This improvement is mainly due to the increasing use of gas. To-day the highest consumption of gas in London is in the Harley Street neighbourhood, occupied by the leading specialists of the country; and it is rare indeed to find a coal fire anywhere in the district. These interesting facts were set forth by Mr. F. W. Goodenough in a recent lecture on hygienic cooking and heating at the Maternity and Child Welfare Exhibition at Argyll Hall, Kensington. Dealing with the various systems of heating, Mr. Goodenough pointed out that the practice of burning raw coal was on the decrease. Only 30,000 tons of soot fell on London, according to official meteorological records, as against 73,000 tons ten years ago, during which period the hours of sunshine recorded rose from a daily average of two to three hours. This was due to the increasing substitution of gas for smoke-producing fuel. The slot-meter, which was introduced about twenty-five years ago, was now to be found in some 4½ million homes in the country. Gas followed nature's way of heating by radiation. Like the solar rays, it warmed only the solid objects upon which it fell, leaving the air itself cool for breathing. The prejudices against gas had been broken down by authoritative medical opinion, which had established that properly constructed and fitted gas appliances were perfectly hygienic for cooking and heating.

Welwyn and Hatfield Debenture Issue.—Messrs. A. & W. Richards are issuing on behalf of the Directors £13,300 of 6 p.ct. redeemable debentures in the Welwyn and Hatfield Gas Company, Ltd. The price of issue is par; and applications must be sent in to the firm, at 37 Walbrook, London, E.C.4, not later than Thursday morning, April 22. The output of gas in the Company's area is rapidly increasing.

Barnet New Water Stock Issue.—The Directors of the Barnet District Gas and Water Company are inviting tenders for £35,000 of "D" capital water stock; the minimum price of issue being £10[illegible] p.ct. The yield at this price, with the maximum dividend of 7 p.ct. per annum now being paid on similar stock, is £6 13s. 4d. p.ct. Tenders must be sent to the Secretary, at 139, Cannon Street, London, E.C.4, not later than Monday morning, April 19.

Insch New Gas Light Company, Ltd.—A meeting of the Company was held on April 6, when it was decided that the Company be wound up voluntarily. The following resolutions were passed: That the Company be wound up voluntarily, and a liquidator appointed; that the liquidator be instructed to accept an offer by the Insch and Rothney Special District to purchase the whole heritable property belonging to the Company, including mains, meters, tools, &c.; and that the liquidator be empowered to grant conveyance of the whole property purchased.

Fenny Stratford Gas Light and Coke Company, Ltd.—The revenue account presented at the annual meeting showed a balance of £3001. It was stated in the report that during the past year bonus shares equal to 50 p.ct. on the ordinary capital, and totalling £4375, were issued, and that this sum had been transferred from profit and loss to capital account. The balance of profit and loss account stood at £3778; and the Directors recommended the payment of a dividend at the rate of 8 p.ct., less income-tax. The price of gas was reduced at January, 1925, by 5d. per 1000 c.ft.; and as the sales of gas increased during the year by 10 p.ct., the Directors felt justified in announcing a further reduction of 3d. per 1000 c.ft., to take effect from the March quarter of this year.

Bridgwater Gas Light Company.—It was reported at the annual meeting of the Company that the sales of gas continue to grow, and for the past year amounted to nearly 110 million c.ft.—an increase of upwards of 6½ million c.ft. over the previous year. Considerable repairs and renewals of the carbonizing plant are required; and a contract for this work has been placed with West's Gas Improvement Company, Ltd. Application is to be made for a Special Order conferring upon the Company extended powers. It was pointed out at the meeting that in 1911-12 8500 tons of coal were carbonized, producing 75 million c.ft. of gas; whereas in 1925 6980 tons of coal were used to produce 120 million c.ft. of gas. Therefore in the latter year they required 1520 tons less of coal for 45 million c.ft. more gas. Mr. J. H. Cornish was re-elected Secretary and Manager, and in returning thanks strongly advised the stockholders not to be frightened out of their holdings by the Government Electricity Bill.

The gas profits at Blackpool for the last municipal year were £7502.

Damage amounting to £150 has been done by fire at the Solihull Gas-Works. The outbreak occurred in the engine-house.

The Blackpool Town Council have approved a new scale of charges for gas. This provides for a reduction of 2½d. per 1000 c.ft. for consumers from 50,000 up to 100,000 c.ft. per meter per quarter, with a further reduction of 2½d. per 1000 c.ft. over this amount.

The Town Clerk of Redcar, Mr. R. McClean, explaining to the Town Council on March 31 why the glowing promises of the advocates of the purchase of the gas-works had not been realized under municipal management, said he was prepared to agree that an excessive price had been paid for the plant. The increase in retail gas prices and the reduced profits of the undertaking were, however, accounted for, not by excessive overhead charges or bad management, but by changed circumstances. Coal was 75 p.ct. dearer and wages were up 80 p.ct. They had taken over the gas-works at the worst possible time. Purchase money had had to be borrowed at 7½ p.ct. interest; and 6½ p.ct. was still being paid. These loans matured in the autumn, however; and he thought it would be possible to re-borrow at rates of interest which would permit of a substantial reduction in the retail price of gas.

STOCK MARKET REPORT.

THERE is little doubt that the labour situation dominated conditions on the Stock Exchange last week. Less than three weeks remain now for a settlement of the differences between the coal owners and miners; and the possibility that no agreement will be come to had, and will have, a depressing effect on the stock markets. In addition to the uncertainty in the labour world, the phenomenal weather and consequent extension of the holidays, the approaching Budget, and the unsatisfactory outlook abroad, all tended to reduce business.

Home Government Stocks, however, held their own, and prices were firm under the lead of War Loan at 102. In the Foreign Market, European reconstruction loans were in demand; German issues being prominent on vague rumours of possible revision of the pre-war mark loans reorganization.

The publication of Lever Brothers' report showed an increased profit for the year, and the fear that the Company were not doing well has been dispelled. It is thought that a preliminary official announcement would have prevented the depreciation in the value of the shares during the past few weeks, and thereby saved a number of small holders from loss of capital.

The Gas Market was no exception to the general rule, and inquiries show that business was at a minimum. Quotations were steady; the only changes being a fall of ½ in the Gas Light ordinary, and rises of 1 in Imperial Continental capital stock and 2 in Alliance and Dublin debenture. It will be observed that the Gas Light and Coke 6 p.c. Brentford red. debenture is now quoted in the list.

Having regard to the importance to the gas industry of any arrangements between the miners and owners which may affect the price of coal, it is not to be expected that there will be any material improvements in stock values during the current month.

The report of the Imperial Continental Gas Association shows a satisfactory increase of over £20,000 in the gross profit as compared with the previous year. The accounts include the final instalment in respect of the German claim; and a dividend at the rate of 13½ p.ct. (actual), in addition to the 5 p.ct. interim dividend paid in November last, is recommended, making 18½ p.ct. for the year, as compared with 34½ p.ct. for 1924.

The following transactions were recorded during the week:

On Tuesday, European 5¼ *ex* div., Gas Light and Coke 81⅞, 81¼, 82, 82¼, 3½ p.ct. maximum 59, 4 p.ct. preference 75¼, 75½, 3 p.ct. debenture 58, Imperial Continental 140¼, 140½, 141, Primitiva 10s. 1d., 10s. 3d., 10s. 4½d., 10s. 6d., South Metropolitan 92, 92⅜, Southampton 78. Supplementary prices, Metropolitan (of Melbourne), £9 5s. 6d.

On Wednesday, Croydon maximum dividend 80¼, 80⅜, Gas Light and Coke 80⅜, 81, 81¼, 81½, 3½ p.ct. maximum 58¼, 4 p.ct. preference 75, 76, Imperial Continental 140½, 140⅜, Primitiva 10s. 6d., South Metropolitan 6½ p.ct. debenture 103¼, Southampton 5 p.ct. maximum 79, Swansea 7 p.ct. preference 101, Tottenham "B" 80½, 80⅜. Supplementary prices, Tottenham 5 p.ct. preference 87.

On Thursday, Croydon sliding-scale 97, 97½, Gas Light and Coke 80⅜, 81, 81¼, 81⅜, 81½, 81⅜, 3 p.ct. debenture 57½, Imperial Continental 140⅜, Primitiva 10s. 6d., South Metropolitan 92. Supplementary prices, Eastbourne 5 p.ct. "A" 108, 3½ p.ct. "B" 100.

On Friday, Brighton and Hove 169½, British 103½, 104, Continental Union 33, Croydon maximum dividend 80½, 80⅜, European 5¼ *ex* div., Gas Light and Coke 80⅜, 81, 81¼, 81⅜, 3½ p.ct. maximum 58, 58¼, 59½, 4 p.ct. preference 75, 75⅞. Primitiva 10s. 1½d., 10s. 3d., 10s. 6d., 4 p.ct. (River Plate) debenture 66½, 1 p.ct. debenture 1011 66, 66¼, South Metropolitan 92, 92½, 92¼, 3 p.ct. debenture 57¼, South Suburban 5 p.ct. 96, 5 p.ct. debenture 94. Southampton 78⅜, Tottenham "B" 80, 80¼. Supplementary prices, Gas Light and Coke Brentford 6 p.ct. debenture 98, 98½, Romford 10 p.ct. 10, 10½, Wandsworth 4 p.ct. debenture 74.

In Lombard Street at the close of the week funds were almost unlendable. While existing day-to-day loans were renewed at from 3⅜ p.ct. to 3½ p.ct., the rate for new loans dropped to 3 p.ct. Discount rates became firmer on the announcement of the Treasury Bill allotment, the average of which was £3 7s. 6·01d. p.ct. No Bonds were on offer.

On the Foreign Exchange Market, both French and Belgian currencies were weaker. After a brief rally the Paris rate again moved up, and closed at the worst point of the day—142.05. Belgian francs closed at 129⅜. Italian lire were a shade cheaper at 120.90. Sterling on New York closed easier at 4.86 $\frac{2}{32}$.

Silver, which had fallen to 20½d. per oz. for the first time since the war, closed at the level figure of 30d. Gold remained at the nominal price of 84s. 11½d. per oz.

The Bank Rate is 5 p.ct., to which it was raised from 4 p.ct. on Dec. 3. Bankers' deposit rates are 3 p.ct. The deposit rates of the discount houses are 3 p.ct. at call and 3¼ p.ct. at notice.

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf. Yr	Dividends. Last Hf. Yr.	NAME.	Quotations. Apl. 9.	Rise or Fall.	Transactions Lowest and Highest Prices.
£			%p.a.	% p.a.				
171,978	Stk.	Feb. 4	5	5	Aldershot 5 p.c. max. C.	74—77	..	..
332,992	,,	,,	4	4	Do. 4 p.c. Pref.	69—74	..	..
1,551,868	,,	Apl. 1	6½	6½	Alliance & Dublin Ord.	68—71*	..	..
374,000	,,	Jan. 7	4	4	Do. 4 p.c. Deb.	60—65	+2	..
300,000	1	Oct. 22	1/7½	1/7½	Bombay, Ltd.	⅞—1	..	..
170,000	10	Mar. 4	8½	8½	Bournemouth 5 p.c.	13—18	..	..
495,050	10	,,	7	7	Do. B 7 p.c.	13—12½	..	..
275,000	10	,,	6	6	Do. Pref. 6 p.c.	11—12	..	..
50,000	Stk.	Jan. 7	3	3	Do. 3 p.c. Deb.	55—58	..	..
102,025	,,	,,	4	4	Do. 4 p.c. Deb.	75—78	..	..
214,740	,,	Mar. 18	12	12	Brighton & Hove Orig.	167—173	..	..
244,200	,,	,,	9	9	Do. A Ord.	130—135	..	169½
1,387,500	,,	Feb. 18	5	5	Bristol 5 p.c. max.	85½—86½a	..	..
855,000	,,	Mar. 18	8	7	British Ord.	100—105	..	..
100,000	,,	Jan. 7	7	7	Do. 7 p.c. Pref.	117—122	..	103¾—104
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb.	69—74	..	..
100,000	10	Dec. 17	8	6	Cape Town, Ltd.	6½—7½	..	..
100,000	10	Nov. 5	4½	4½	Do. 4½ p.c. Pref.	6—7	..	..
150,000	Stk.	Jan. 7	4½	4½	Do. 4½ p.c. Deb.	68—73	..	..
626,860	,,	Feb. 18	6	6	Cardiff Con. Ord.	96—99	..	..
237,860	,,	Jan. 7	7½	7½	Do. 7½ p.c. Red. Deb.	98—101	..	..
157,150	,,	Mar. 4	5	6½	Chester 5 p.c. Ord.	87½—92½b	..	..
79,185	1	Oct. 8	—	2/-	Colombo Ltd. Ord.	25/—27/-	..	..
24,495	1	,,	—	1/4½	Do. 7 p.c. Pref.	21/—23/-	..	..
1,513,280	Stk.	Mar. 4	5½	5½	Commercial 4 p.c. Cap.	77—82	..	..
560,000	,,	,,	5/3/1	5/3/4	Do. 3½ p.c. Cap.	76—81	..	..
475,000	,,	Dec. 17	3	3	Do. 3 p.c. Deb.	55—58	..	..
800,000	,,	Oct. 8	—	4	Continental Union, Ltd.	33—38	..	33
200,000	,,	Mar. 4	7	7	Do. 7 p.c. Pref.	85—88	..	..
737,150	,,	Mar. 4	6½	6½	Croydon sliding scale	95—98	..	97—97½
403,100	,,	,,	5	5	Do. max. div.	79—82	..	80½—80⅝
492,270	,,	Mar. 4	6	9	Derby Con.	107—103e	..	..
55,000	,,	Dec. 17	4	4	Do. Deb.	74—76e	..	..
209,000	,,	Mar. 4	5	5	East Hull Ord. 5 p.c.	86—89	..	..
50,000	,,	Dec. 17	—	5	Eastbourne 5 p.c. Deb.	93—98	..	..
1,002,180	10	Apl. 1	6	4	European, Ltd.	5—6*	..	5½
13,788,960	Stk.	Feb. 18	5½	4/17/4	Gas Light & Coke 4 p.c. Ord.	80½—82½	−½	80½—82½
2,600,000	,,	,,	3½	3½	Do. 3½ p.c. max.	58—61	..	58—59⅛
4,157,030	,,	,,	4	4	Do. 4 p.c. Con. Pref.	74—77	..	75—76
5,003,620	,,	Dec. 17	3	3	Do. 3 p.c. Con. Deb.	58—61	..	57½—58
181,315	,,	—	—	—	Do. 6 p.c. Br'tf'd Rd. Db.	102—104	..	..
130,000	,,	—	10	10	Do. 10 p.c. Bonds	..	..	..
42,000	,,	—	7½	7½	Do. 7½ p.c. Ilford Deb.	..	..	..
82,500	,,	Mar. 18	6⅔	6⅔	Hastings & St L. 5 p.c. Conv	88—93	..	..
258,740	,,	,,	5⅓	5⅓	Do. 3½ p.c. Conv.	68—73	..	..
70,000	10	Sept. 24	10	10	Hongkong & China, Ltd.	19⅝—20⅜	..	..
86,600	Stk.	Mar. 4	10	10	Hornsey 7 p.c.	128—133	..	..
1,976,000	,,	Nov. 19	59	10	Imperial Continental Cap.	137—142	+1	140½—141
226,170	,,	Feb. 4	3½	3½	Do. 3½ p.c. Red. Deb.	69—72	..	..
235,242	,,	Mar. 18	6½	6½	Lea Bridge 5 p.c. Ord.	95—100	..	..
2,127,340	,,	Feb. 18	5½	5½	Liverpool 5 p.c. Ord.	78½—79½b	..	..
600,000	,,	Mar 18	7	7	Do. 7 p.c. Red. Pref.	101½—103½b	..	..
165,736	,,	Feb. 18	9	8	Maidstone 5 p.c. Cap.	115—120	..	..
63,480	,,	Dec. 17	3	3	Do. 3 p.c. Deb.	54—59	..	..
75,000	5	Dec. 3	7	6	Malta & Mediterranean	4½—5	..	..
541,920	Stk.	Nov. 19	4	4	Montevideo, Ltd.	70—74	..	..
2,061,315	,,	Mar. 4	5	5	Newcastle & Gateshead Con.	73—74d	..	..
360,929	,,	,,	4	4	Do. 4 p.c. Pref.	75—76d	..	..
529,705	,,	Dec. 17	3½	3½	Do. 3½ p.c. Deb.	70—72d	..	..
15,000	,,	Mar. 4	11½	11½	North Middlesex 10 p.c.	155—160	..	..
91,580	,,	,,	8⅚	8⅚	Do. 7 p.c.	112—117	..	..
300,000	Stk.	Dec. 3	7	9	Oriental, Ltd.	98—103	..	..
188,120	,,	Jan. 7	7¼	7½	Plym'th & Ston'house 5 p.c.	110—115	..	..
60,000	50	Mar. 4	14	14	Portsea Island B	90—95	..	..
100,000	50	,,	13	13	Do. C	88—93	..	..
2,389,909	1	,,	—	—	Primitiva Ord.	10/0—11/0	..	10/1—10/6
322,600	100	Dec. 1	4	4	Do. 4 p.c. Red. Deb.	82—84	..	..
600,000	Stk.	Jan. 21	4	4	Do. 4 p.c. Red. Deb. 1911	66—68	..	66—66½
364,496	,,	Dec. 17	4	4	Do. B. Aires 4 p.c. Rd. Db.	66—68	..	..
150,000	,,	,,	4	4	Do. R'r P'te 4 p.c. Rd. Db.	66—68	..	66⅔
195,000	10	Mar. 18	6	6	San Paulo 6 p.c. Pref.	7⅛—8	..	..
270,000	50	Jan. 4	5	5	Do. 5 p.c. Red. Deb.	48—46	..	..
419,968	Stk.	Mar. 18	5½	6	Sheffield A	97—99e*	..	..
1,047,000	,,	,,	5½	6	Do. B	97—99e*	..	..
90,000	10	June 11	6	4	Do. C	97—99e*	..	..
5,609,895	Stk.	Mar. 4	5	7	South African	5—7	..	..
1,895,445	,,	Jan. 7	3	3	South Met. Ord.	91—93	..	92—92¾
734,000	,,	Mar. 4	6½	6½	Do. 3 p.c. Deb.	56—59	..	57½
91,500	,,	Mar. 4	8½	8½	Do. 6½ p.c. Red. Db.	102—104	..	103½
1,187,795	,,	Mar. 4	6½	6½	South Shields Con.	121—123d	..	..
368,817	,,	Dec. 17	5	5	South Suburban Ord. 5 p.c.	96—99	..	96
647,740	,,	Mar. 18	5	5	Do. 5 p.c. Deb.	94 97	..	94
121,275	,,	Jan. 7	4	4	South'mpton Ord. 5 p.c. max	77—80	..	78—79
250,000	,,	Mar. 4	7	7	Do. 4 p.c. Deb.	69—74	..	..
200,000	,,	Dec. 17	6½	6½	Swansea 7 p.c. Red. Pref.	100—102	..	101
120,000	,,	Feb. 18	7½	7½	Do. 6½ p.c. Red. Deb.	100—102	..	..
882,275	,,	,,	5¼	5⅞	Tottenham District A 5 p.c.	107—112	..	..
150,000	,,	,,	23/4	5½	Do. B 3½ p.c.	87—90	..	89—89⅜
181,255	,,	Dec. 17	4	4	Do. 5½ p.c. Pref.	101—103	..	..
238,251	,,	Mar. 18	5	5	Do. 4 p.c. Deb.	74—77	..	..
					Tynemouth Con. and New	67 - 68d	..	..
197,294	,,	Mar. 4	6⅜	6⅜	Uxbridge, Maidenhead, & Wycombe 5 p.c.	90—95	..	..
88,330	,,	,,	5	5	Do. 5 p.c. pref.	85—90	..	..
91,800	,,	,,	6⅜	6⅜	Do. 5 p.c. Maidenh'd	87—92	..	..
					Wandsworth, Wimbledon, and Epsom—			
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